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NEW ENGLAND

HISTORIC, GENEALOGICAL SOCIETY.

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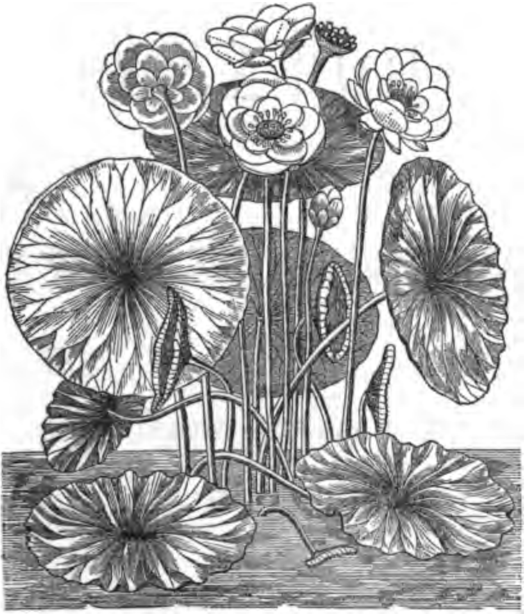

Figure 1. Nelumbium lūteum, (Nelumbo,) a water plant, frequent in the Western and Southern States. Scapes 3 to 5 feet high. In the cut are shown the leaves, flowers and fruit.

FIRST LESSONS

IN

BOTANY:

DESIGNED FOR

COMMON SCHOOLS IN THE UNITED STATES.

BY ALPHONSO WOOD, A.M.,

AUTHOR OF "THE CLASS-BOOK OF BOTANY.

BOSTON:
CROCKER AND BREWSTER
CLAREMONT, N. H.
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KC 11285.

THE Science of Botany has for its objects the most lovely of all the inanimate works of God. It treats of those beautiful forms which annually unfold themselves to our admiring gaze—which everywhere clothe and decorate the teeming surface of the earth, affording directly or indirectly the sustenance of all animals, and regaling every sense of every creature which has a capacity to be gratified. It is a science peculiarly appropriate to gentle minds. Its cultivation imposes no tax upon the feelings, shocks no sensibility, involves no cruelty. All its incidents and attributes are promotive of health and pure intellectual pleasure.—Why should not such a science be made an indispensable branch of education? As a mere *accomplishment* it is entitled to rank with any of those ornamental acquirements to which so much time is devoted. As a means of enlarging and disciplining the mind, training it to habits of correct observation and profitable reflection, the Study of Plants is far superior to many of those fashionable and fugitive attainments which now so frequently engross the attention of the young. It is a pursuit, too, which carries with it its own reward. The knowledge which it affords is at once pleasing in the acquisition, and of enduring value. It is continually called for, and always ready at command, to minister to the gratification of its possessor, whether in the garden, the field, or the forest.—DR. WM. DARLINGTON.

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SUGGESTIONS TO TEACHERS.

In preparing this little work for the younger portion of the American community, the following well-known principles of Education have been kept constantly in view:—

1. That in the study of any science, *the discipline of the mind* is an attainment of at least equal value with *the acquisition of knowledge.*

2. That to remove from a school book all that is hard to be pronounced or difficult to be understood, is to strip it of all that is truly valuable either in science or discipline.

3. That the *first lessons* which children learn, since they are most likely to be permanent, should contain *truth*, however small the portion, neither simplified to childishness nor glossed with error.

Accordingly, while the author has endeavored to render the First Lessons in Botany as plain and attractive as possible, he has at the same time freely admitted many of the technical terms of Science, with explanations, as being, in part, the very things which the pupil should begin early to comprehend. Neither has he excluded any principle of the Science merely because it is difficult to be understood, and requires *reflection;* but on the contrary, he has even aimed to furnish the child with material for bringing thought and reflection into early exercise.

But the means by which it has been here attempted to place this delightful and ennobling science within the comprehension of the child, are, by a careful definition of all the scientific terms employed, and by limiting the principles here exhibited to a very few in number, and to such as are strictly primary in importance and interest, and primary in the order of nature, simply expressed, and copiously illustrated.

It is also earnestly recommended to teachers to see to it that their pupils thoroughly understand what they recite, by superadding illustrations of their own—by pointing out, in fresh or living specimens, the very form, structure, or property alluded to in the text—by frequent drawings upon the blackboard, and more than all, by magnified views with lenses. The more powerful the lens, the more beautiful and wonderful appears the work of the Divine hand in the vegetable structure.

By such means, the learner will soon become ardent in his pursuit; and when his interest in Botany is once excited, there need be no fears for his future progress.

In using the Flora, let the teacher inform his pupils at the commencement, that the design of it is not now to make them acquainted with the Flora of the country, but simply to teach them *how to analyze plants;* therefore they must not expect to find in this little work anything like a full account of all our plants, but only a few plain exercises by which they may trace every Flowering Plant in the United States to its Natural Order, about one in every two to its Genus, and about one in every five to its Species. In conducting an exercise in this Flora with a class of pupils who have well studied the former part of the work, some method like the following would be interesting and profitable. Suppose your class assembled, and each pupil supplied with a specimen of some one species of plants both in flower and with fruit.

Teacher. Are you all ready? Turn to the Flora, and let us find out together the family relations and the names of this fine little plant. John, commence at the "Review of the Natural System" and read the first pair of lines, which we will call a *couplet.*

John (*reads*). "Plants bearing flowers (Phænogamia).
"Plants never bearing flowers (Cryptogamia)."

Teacher. To which of these great divisions does your plant belong?

John. To the Flowering Plants, sir, for it has both flowers and fruit.

Teacher. Now tell us to which couplet we shall next pass.

John. To the second.

T. Very well. Edward, you may read and determine the second couplet in the same manner.

Edward. "Leaves net-veined, flowers never wholly 3-parted (Exogens)."
"Leaves parallel-veined, flowers 3-parted." My plant seems to be an Exogen, having net-veined leaves and 5-parted flowers. Pass to No. 3.

T. Now let it pass along, and if a wrong decision is made, let those who observe it raise their hands.

Sarah. "Stigmas present. Seeds enclosed in a pericarp (Angiosperms)."

"Stigmas none. Seeds naked." These flowers have pistils, although very small. I think it is an Angiosperm. Pass to No. 6.

Eliza. "Corolla with distinct petals."

"Corolla with united petals." The petals are united in my specimen, forming a tube at base. Pass over to No. 76.

Jane. "Herbs."—"Trees, shrubs, and undershrubs." This plant is an herb. Pass next to No. 77.

Mary. "Stem prostrate or climbing, furnished with tendrils."

"Stem not furnished with tendrils." I do not remember what tendrils are. (*Several hands are raised.*)

T. Edward, do you know what tendrils are?

Edw. Yes. Tendrils are very slender, leafless branches laying hold of other objects for support, coiling and twisting.

T. Are trees or stout herbs ever furnished with tendrils?

Edw. No, sir. They do not need to hold themselves up by other objects; they can stand alone.

T. You are right. And here we see that plants teach us of their Great Creator: for if they had no Creator, but grew up by accident, do you think, Mary, that tendrils would not be as likely to grow on Oak trees as on Grape vines?

Mary. It would be curious indeed to see tendrils on an Oak, neither do I see any tendrils here; so turn to No. 78.

Louisa. "Leaves alternate," &c. These leaves are alternate. No. 79.

Nancy. "Flowers regular."—"Flowers irregular." These flowers are irregular." Turn to No. 90.

Lucy. "Ovary adherent to the calyx tube—inferior."

"Ovary free from the calyx tube—superior." These ovaries are very small, but—I now see them plainly with my lens. They are above or inside the calyx, and do not adhere to it. No. 91.

Emily. "Stamens 2, or 4 and didynamous," &c.

"Stamens 10. Corolla papilionaceous." This plant answers to the last line. We must therefore turn back a great ways to No. 36.

Caroline. "Fruit a 3-celled capsule."

"Fruit a legume with 1 or several seeds." This fruit is so very small I can hardly see it, but—I should think—it had but one cell, and 4 seeds, as in the second line. It therefore belongs to the Order 47.

T. You are right. You have now arrived at the name of the Family to which our plant seems to belong. Let us now turn to that Order, and learn the *Genus* of the plant. But before we look into the "Analysis of the Genera," we should very carefully compare our plant with the characters of the Order, so that we may be sure we have arrived at the right conclusion. John will read aloud these characters, and the class will consider whether their specimens answer to each.

John (reads). "Plants with alternate, stipulate, mostly compound leaves," (&c., to the end.)

T. Since we now are confident that we have a *Leguminous plant*, we will commence the "Analysis of the Genera." Edward, the first couplet.

Edw. "Corolla papilionaceous."—"Corolla not papilionaceous." These flowers are papilionaceous. Pass to No. 2.

Sarah (after reading the ten lines). These leaves are palmately 3-foliate, and the plant an herb; turn therefore to No. 21.

Eliza (after reading the couplet). Our plant has its stamens in 2 sets, or 9 together and 1 alone; the pods are small and the flowers in heads. It must therefore be a Trifòlium.

T. We now turn to that Genus and read its characters as we did in the Order, for the sake of confirmation and a better knowledge.

(*Jane* reads the characters of the Genus aloud.)

T. We are now ready for the analysis of the *species.* Mary, proceed.

Mary. "Flowers purple or roseate, sessile, (*&c., reading through the triplet.*) These flowers are white, each on a little stalk, like an umbel, and the whole on a long stalk. Pass to No. 2.

Louisa. "Stipules membrane-like. Plants smooth," &c. Turn to No. 5.

Nancy. "Stems all creeping. Peduncles 5′—8′ long. Pods 4-seeded." All this suits our plant. It must therefore be TRIFÒLIUM REPENS.

DIRECTIONS IN PRONUNCIATION.

In this work, all scientific words of more than two syllables, and many others which the young learner might find it difficult to pronounce aright, are carefully accentuated according to the following rules:

Two marks of accent are in general use, called the grave accent (`) and the acute accent (′).

The accented syllable of a word is denoted by having one or the other of these marks placed over its vowel.

If the grave accent be used, it denotes that the vowel is long in sound, and in pronunciation is to be separated from the consonant which follows; as, Fragària (pronounced Fra-gà-ri-a).

If the acute accent be used, it denotes that the vowel is short, and in pronunciation is joined to the consonant which follows; as, Diánthus (pronounced Di-án-thus).

THE GREEK AND LATIN NUMERALS.

(TO BE THOROUGHLY COMMITTED TO MEMORY.)

Numbers.	Latin.	Greek.
1	unus	heis *or* monos.
2	duo	duo *or* dis.
3	tres	treis.
4	quatuor	téssares *or* tetras.
5	quinque	pente.
6	sex	hex.
7	septem	hepta.
8	octo	okto.
9	novem	énnea.
10	decem	deka.
11	úndecem	hèndeka.
12	duódecem	dòdeka.
20	vigínti	eikosi.
00 (many)	multi	polys.

CONTENTS.

Suggestions to Teachers .... page 5
Directions in Pronunciation .... " 9
Abbreviations and Signs .... " 12
Lesson I. Introduction .... " 13
Lesson II. Classification introduced .... " 15
§ 1. Grand Divisions .... paragraph 19 to 23
§ 2. Genera and Species........................ " 24—29
Lesson III. Of the Root .... page 17
Lesson IV. Of the Stem .... " 20
§ 1. Its outward Forms and Organs........................ paragraph 54—62
§ 2. Origin and Arrangement of the Branches " 63—77
§ 3. Of Subterranean Stems........................ " 78—92
§ 4. Of Aërial Stems........................ " 93—109
Lesson V. Of the Internal Structure and Growth of Stems... page 28
§ 1. Exogens........................ paragraph 110—131
§ 2. Endogens........................ " 132—135
Lesson VI. Of the Leaf .... page 32
§ 1. Arrangement and Position........................ paragraph 140—146
§ 2. Structure of the Leaf........................ " 147—154
§ 3. Venation of the Leaf........................ " 155—167
§ 4. Form and Figure of the Leaf........................ " 168—179
§ 5. Margin of the Leaf........................ " 180—191
§ 6. Apex of the Leaf........................ " 192—196
§ 7. Surface of the Leaf........................ " 197—205
§ 8. Of Compound Leaves........................ " 206—223

LESSON VII. Of Stipules and Bracts........................ page 46
§ 1. Duration of the Leaf.................... paragraph 232
LESSON VIII. Of Inflorescence.............................. page 48
LESSON IX. Of the Flower.................................. " 52
LESSON X. Of the Calyx.................................... " 54
LESSON XI. Of the Corolla................................. " 55
LESSON XII. Of the Nectary and Disk....................... " 58
LESSON XIII. Of the Stamens............................... " 59
§ 1. Of the Linnæan Classes.............. paragraph 304—312
LESSON XIV. Of the Pistils................................ page 62
§ 1. Of the Linnæan Orders.................. paragraph 323
§ 2. Of the Ovary and Ovules................. " 324—332
LESSON XV. Of the Arrangement and Plan of the Flower.... page 65
LESSON XVI. Of Æstivation and Vernation.................. " 67
LESSON XVII. Of the Fruit................................. " 68
§ 1. Forms of the Fruit......................... paragraph 361—386
LESSON XVIII. Of the Seed................................. page 73
LESSON XIX. Systematic Botany............................. " 76
§ 1. Of the Artificial System.................. paragraph 410—412
LESSON XX. Of the Natural System.......................... page 79
§ 1. Of the Natural Orders.................... paragraph 426—430
LESSON XXI. Concerning the Analysis of Plants............ page 82
LESSON XXII. About Preserving Plants..................... " 86
A Synopsis, or Review of the Natural System............... " 88
Subclass I. Polypetalous Exogens.......................... " 101
Subclass II. Monopetalous Exogens......................... " 164
Subclass III. Apetalous Exogens........................... " 217
CLASS III. Aglumaceous Endogens........................... " 221

ABBREVIATIONS AND SIGNS,

OFTEN USED IN DESCRIPTIVE BOTANY.

ach. achenia.
æst. æstivation.
alter. alternate.
anth. anther.
axill. axillary.
c. common.
cal. calyx.
caps. capsule.
cor. corolla.
decid. deciduous.
diam. diameter.
emarg. emarginate.
f or *ft.* feet.
fil. filaments.
fl. flower; *fls.* flowers.
fr. fruit.
hd. head; *hds.* heads.
hyp. hypogynous.
imbr. imbricate.
inf. inferior.
invol. involucre.
irreg. irregular.
leg. legume.
lf. leaf; *lvs.* leaves.
lfls. leaflets.
ova. ovary.
pet. petals.
r. rare, uncommon.
recep. receptacle.
reg. regular.
rhiz. rhizoma.
rt. root.
sds. seeds.
seg. segments.
sep. sepals.
st. stem.
sta. stamens.
stig. stigmas.
sty. styles.

The names of *months* and of *states* and *countries* are often abbreviated, and in the same manner as in other works; thus, Apr. April; Jn. June. Mass. Massachusetts; N. Y. New York, &c.—In this work, however, the localities of plants are simply designated by the following abbreviations;—

N. Northern, that is, the Northern portion of the United States.
N-E. New England, or the North-Eastern States.
N-W. the North-Western States. E. the Eastern, or the Atlantic States.
W. the Western, or states bordering on the Mississippi and Ohio Rivers.
M. the Middle portions of the United States.
S. the Southern States.
S-E. the South-Eastern, and S-W. the South-Western States.

The following Signs are also in general use:

① An annual plant. ♄ A plant with a woody stem.
② A biennial plant. ♀ A staminate flower or plant.
♃ A perennial herb. ♂ A pistillate flower or plant.
☿ A perfect flower, or a plant bearing perfect flowers.
⚥ Monœcious, or a plant with staminate and pistillate flowers.
♀ ♂ Diœcious; staminate and pistillate flowers on separate plants.
♀ ☿ ♂ Polygamous; the same species with staminate, pistillate, and perfect fls.
0 Wanting or none. § A naturalized plant.
00 Indefinite or numerous. † A plant cultivated for ornament.

‡ A plant cultivated for use. This, with the two last, are placed at the end of a description. In other situations they have their usual signification as marks of division or reference. In measure of length, or other dimensions, the following signs are adopted in this work:—

f (without the period), a foot.
′ (a single accent), an inch.
″ (a double accent), a line (one twelfth of ′).

LESSON I.

INTRODUCTION.

1. *What is Science?*—Science is knowledge well arranged, or *classified knowledge.* Thus, Geography is the arranged or classified knowledge of the world and its inhabitants. Grammar is the classified knowledge of language.

2. *What is Natural Science?*—Natural Science relates to the Natural World, and is divided into three departments, according to the three great Kingdoms of Nature.

3. *What are the three great Kingdoms of Nature?*—The Animal Kingdom, Mineral Kingdom, and Vegetable Kingdom.

4. *To which of these does Botany relate?*—Botany is the Science of the Vegetable Kingdom. It includes the knowledge of plants in general—of their habits, structure, uses, names and classification.

5. *Can you define a Plant?*—A plant is a being endowed with life, but not with sense. It lives, grows, and dies, but does not feel or think.

6. *How are Plants related to Minerals and Animals?*—Plants derive their own food from the earth, air and water, that is from the Mineral Kingdom, and from plants is derived the principal nourishment of the Animal Kingdom. In other words, animals feed on plants, and plants feed on minerals.

7. *How does a Plant begin to grow?*—In its earliest state, a plant is a little *émbryo* contained in a seed. When the embryo begins to grow, it lengthens in two directions. One part, called the rad-

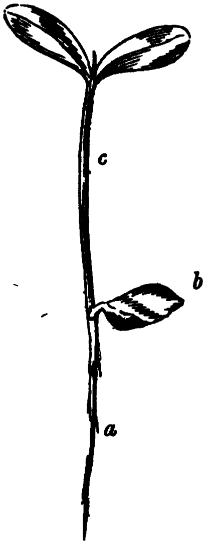


Fig. 2.

icle (rootlet), descends into the dark, damp earth; the other part, called the plumule (little plume), ascends into the air, and spreads itself out to the light.

(*Can you make this plain by Fig.* 2?—Yes: *b* is the seed from which the radicle, *a*, has grown downward, and the plumule, *c*, upward.)

8. *Of what are Plants composed?*—The matter or substance of plants consists of certain structures, of wonderful form, called the VEGETABLE TISSUES. They are of several kinds, but we must not stop to describe them now. (See § 119, 123. Also Class-Book of Botany, pages 21—23.)

9. *What important organ is here to be noticed?*—The EPIDÉRMIS or skin, which envelopes nearly every part of the tissues of the plant, where they are exposed to the air.

10. *Mention examples.*—That delicate membrane which may be stripped off from the leaf of the garden Iris, or the Houseleek, is the epidermis. It is always thus transparent and colorless.

11. *What say you of the clothing of the epidermis?*—It is either smooth, or clothed with various processes called hairs, glands, prickles and stings.

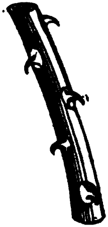
12. *What are hairs?*—HAIRS are minute processes drawn out from the epidermis, and made of the same kind of tissue. They vary much in different plants, constituting different kinds of clothing.

13. *When is the surface said to be glàbrous?*—When it is smooth, or destitute of hairs, prickles, &c.

14. *Pubéscent?*—When it is clothed with short, soft and downy hairs?

15. *Hirsute?*—When clothed with longer hairs.

16. *Scabrous* or *rough?*—When the hairs are very short and stiff.



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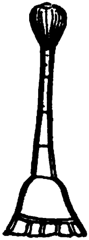

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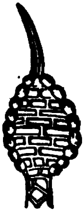

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(*What do these figures represent?*—4 represents a branched hair as it appears under a strong magnifier; 5 an unbranched or simple hair; 6 is a hair with a gland on it; 7 also is a gland on the top of a hair; 8 represents the hooked prickles of a rose-bush, not magnified; 3 represents a sting of a Nettle much magnified.)

17. *Toméntose?*—When clothed with short, dense and woolly hairs.

18. *Cíliate?*—When fringed with hairs on the margin. Many other terms of this kind are used, and will be found described in the Glossary.

LESSON II.

CLASSIFICATION INTRODUCED.

§ 1. GRAND DIVISIONS.

19. *Enumerate the parts of a complete plant.*—A full-grown and complete plant consists of five principal parts or organs; namely, root, stem, leaves, flower and fruit; each having its own proper office in the life and growth of the vegetable.

20. *How do plants vary in respect to these organs?*—While most plants possess *all* these organs, there are many kinds which are always destitute of one or more of them. Thus the Ferns and the Mosses have no flowers, and the Lichens (lì-kens) have neither leaves nor flowers.

(*Explain Fig.* 9.—It represents a Trillium (often called *Wake-robin*), with the principal parts or organs a little separated, so as to show them distinctly: *a* is the root; *b*, the stem; *c*, the leaves; *d*, *e*, *f* and *g*, the parts of the flower and fruit, more particularly, *d* is the calyx; *e*, the corolla; *f*, the stamens, and *g*, the pistils which become the fruit.)

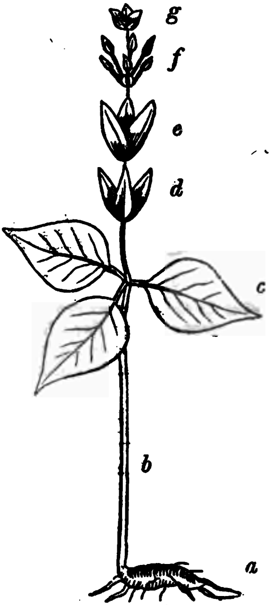


Fig. 9.

21. *State, now, the two grand divisions of the Vegetable Kingdom.*—In consequence of this, the whole Vegetable Kingdom has usually been considered, by botanists, under two great natural divisions, which are,

I. The Phænogàmia (fen-o-gă-mi-a), or Flowering Plants, and

II. The Cryptogàmia, or Flowerless Plants.

22. *Distinguish them by their fruit also.*—The Flowering Plants produce seeds, each of which has within it an *embryo*, or little plant; but the Flowerless plants produce *spores* instead of seeds.

23. *What are* SPORES?—They are certain little boddies appearing like particles of dust, having no embryo, or little plant, within them; such, for example, as the fruit of a Fern plant, growing in little brown spots upon the back of the leaf. (Figs. 10 and 11.)

10. Blechnum.

11. Polypod.

(In the following pages, we shall speak of the organs of the Flowering Plants only.)

§ 2. GENERA AND SPECIES.

24. *What is a species?*—A SPECIES of plants embraces all such individuals as are of the *same kind*, having originated from the same stock. Such plants bear a strict resemblance to each other, as well as to the common parent, in all their parts.

25. *Please illustrate your meaning.*—The *White Clover* is a species, called, in the Latin language, *Trifolium repens.* Under this species, we include millions of individual plants, scattered over the hills and plains, all of a common descent, and producing other individuals of their own kind from their seeds.

26. *How many species of plants are known?*—The vast multitude of individual plants which clothe the surface of the earth, are classified into more than eighty thousand (80,000) known species.

27. *What is a Genus?*—A GENUS is an assemblage of species which have more points of resemblance than of difference; in other words, which agree in more respects than they disagree.

28. *Please illustrate.*—The genus Clover (Latin, *Trifòlium*) includes the species White Clover (T. repens), Red Clover (T. pratense), the Yellow Clover (T. agràrium), and many others; which we call, in conversation, *different kinds* of Clover. The genus *Pine* (Pinus) also, includes the White Pine, the Pitch Pine, the Norway Pine, and many other *kinds*, all closely similar in *most* respects, but plainly different in *several.*

29. *What is the number of genera now known?*—About twenty thousand (20,000).

LESSON III.

OF THE ROOT.

30. *Please state the general character of the root.*—The ROOT is the basis of the plant, and the principal source of its nourishment. It originates with the radicle (§ 7) of the seed, grows downward, and is generally buried in the soil.

31. *How distinguished from stems?*—By its downward direction, by its thread-like fibres, by the irregular arrangement of the branches, and the absence of buds and pith.

32. *What are the principal parts of the root?*—The caudex, fibrils and spongelets.

33. *Describe the* CAUDEX *or stock.*—It is the main body of the root.

34. *The* FIBRILS.—These are the finer branches of the roots, usually no larger than threads.

35. *The* SPONGELETS.—The tender and delicate *extremities* of the fibrils, at which they absorb moisture and food, and from which they grow.

36. *What is the most common form of roots?*—The *branching root* (Fig. 12), like those of trees and shrubs. It divides and subdivides, sending off branches from the main stock, but in no regular order.

37. *What say you of the roots of trees?*—They extend to no great depth, but in all directions beneath the surface, and to distances equal to, and sometimes far greater than, the height of the tree. Forest trees, being less exposed to wind, are less firmly rooted than trees in open situations.

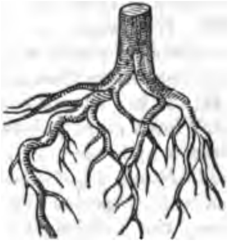


Fig. 12.

38. *The* FIBROUS ROOT?—All roots are fibrous, more or less; but only those roots are properly called fibrous, which consist almost wholly of thread-like divisions sent off directly from the base of the stem, without a caudex. Such are the roots of most of the grasses (Fig. 13.)

39. *The* FLESHY ROOTS—*what is said of them in general?*—The root often serves as a *store-house* for the plant, and becomes thick and fleshy in consequence of the nutritious matter stored away in its tissues, against the time of flowering.

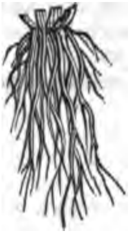


Fig. 13.

40. *Of what does this nutritious matter generally consist?*—Of starch.

41. *Please describe some of the forms of fleshy roots, beginning with the fasciculate* (Fig. 14).—Fasciculated roots are like the fibrous, having some of the fibres thickened, as in the Crowfoot, Pæony and Dahlia.

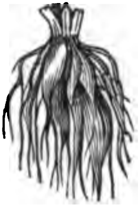


Fig. 14.

42. *The fusiform* (Fig. 15). The spindle-shaped; consisting of a thick, fleshy caudex, tapering downward, and sending off many fibres from the sides and end. These fibres are, in fact, the true roots, since they alone absorb nourishment from the ground. The Beet, Carrot, and Parsnip are examples.

43. *The premorse root.*—It is a variety of the fusiform, in which the caudex ends abruptly at the lower end as if *bitten* square off, as in the Foot-leaved Violet (Vìola pedàta, Fig. 16).

44. *The napiform root.*—This is another variety of the fusiform, in which the upper portion swells out so that the diameter is as great as the length, as in the Turnip (Fig. 17). Neither of these kinds is very common.

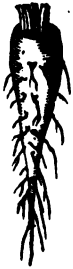


Fig. 15.

45. *But some roots are not fixed in the soil: will you describe them pàrticularly?*—Some are *floating*, and always suspended in the water, as those of the Duckmeat (Lemna). Others fix themselves on other plants, but derive their nourishment chiefly from the air; as, the Ivy, Poison Ivy, &c. Such roots may be called *aërial.*

46. *Describe the parasite roots.*—The roots of certain plants, called parasites, penetrate the bark and draw their nourishment from the juices of other plants which support them; as, the Dodder.

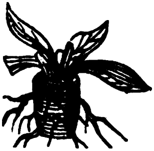


Fig. 16.

47. *What say you of the duration of roots?*—They are either annual (denoted in description by this mark ①), or biennial (②), or perennial (♃).

48. *What are annual roots?*—① They are roots which die with the whole plant at the end of the first season, immediately after the fruit is matured; as, the Cotton plant, Rice, and Indian Corn.

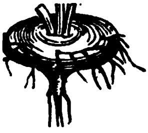


Fig. 17.

49. *Biennial?*—② Such as do not usually bear fruit the *first* season, but exhaust their stores of nutriment the *second* season by fruit-bearing, and immediately die. Such are the fusiform, napiform, and thickened roots generally.

50. *Perennial?*—♃ These survive fruit-bearing, and live many years; as the Butter-cups, Rose, and all trees and shrubs.

51. *What is the most obvious use of the root?*—To fix the plant in the soil, and maintain its upright position.

52. *The most important use?*—The most important use of the root is *absorption*, or drawing from the soil that moisture and food which its growth absolutely requires.

53. *What part of the root performs this office?*—Not the whole surface, but only the spongelets at the ends of the fibrils, where the tissue is loose and spongy. From the spongelets the sap is conveyed by the tissues of the fibrils to the main root, and thence carried up by the stem, and distributed to all parts of the plant.

LESSON IV.

OF THE STEM.

§ 1. ITS OUTWARD FORMS AND ORGANS.

54. *You may repeat the general definition of the stem.*—The STEM is that part of the plant which originates with the plumule (§ 7) and grows upward, expanding itself to the influence of the air and the light.

55. *What is said of the direction of the stem's growth?*—Although the first direction of the stem's growth is upward, yet there are many plants in which it does not continue so, but extends itself in an oblique or horizontal direction, either just above the surface of the ground, or just beneath it.

56. *Can you state the varieties of the stem in this respect?*—When the stem continues to arise upward toward the zenith, it is said to be *erect*. When it grows horizontally upon the surface of the ground,

it is then *creeping*, *trailing* or *procumbent*. When it arises obliquely, it is an *ascending* stem, and when it never arises above the surface of the ground, it is called a *subterranean* stem.

57. *Can you state the varieties of the stem in respect to duration?*—The same as in the root; viz., an ① *annual* stem lives but one season, then dying, at least, down to the root: a ② *biennial* lives two years, and a ♃ *perennial* exists beyond two seasons, to an indefinite period of time.

58. *How do you classify plants in respect to the size and form of the stem?*—Plants are distinguished or classed into trees, shrubs and herbs.

59. *What is a* TREE?—It is a plant with a firm, woody stem or *trunk*, which does not divide into branches for a certain distance above the ground. The Elm, Sugar Maple and Palm are examples.

60. *What is a* SHRUB?—A shrub is a plant of smaller dimensions than a tree, having a perennial, woody stem, which divides into branches at or near the surface of the ground, like the Alder and Berberry.

61. *What shall we call a shrub of diminished size, like the Low Blueberry?*—An UNDERSHRUB.

62. *What is an* HERB?—An herb is a plant with an annual, biennial or perennial root, producing stems which, above the ground, endure but a single season, and do not become woody. Examples, ① Mullein, ② Parsnip, ♃ Butter-cups.

§ 2. OF THE ORIGIN AND ARRANGEMENT OF BRANCHES.

63. *Please state a special characteristic of stems.*—The formation of buds. At the commencement of its growth, the stem itself is a bud.

64. *Classify buds.*—Buds are of two kinds: the leaf-bud and the flower-bud—the former containing the elements of a leafy branch, and the latter the same elements changed into the organs of a flower.

65. *Describe the leaf-bud more particularly.*—A leaf-bud consists of a little tender growing point connected with the pith, surrounded and protected by a covering of young leaves and scales

66. *Can you tell me what is said concerning the Simple Stem?*—The plumule, which is in fact the *first bud*, grows at first in one direction only, and forms a simple stem (that is, without branches); and being itself continually renewed, it is always borne at the end or summit of that stem: in other words, *the stem is always terminated by a bud* (Fig. 18, *t*).

67. *Where else are buds formed?*—Besides this terminal bud, there is also always a bud in the axil of each leaf (Fig. 18, *a*, Fig. 19, *b*). These are therefore called axillary buds.

68. *Where is the Axil of a leaf?*—It is *just above* the origin of the leaf-stalk.

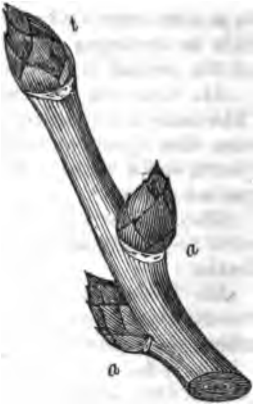


Fig. 18.

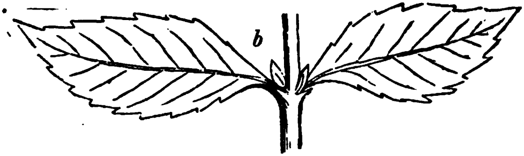


Fig. 19.

69. *How are the branches of the stem formed?*—By the growth of these axillary buds. But if these buds remain inactive, no branches will be formed at all, and the stem will remain simple, as in the Mullein.

70. *How, then, do you define a Branch?*—A BRANCH is a division of the stem, produced by the growth of an axillary bud.

71. *What is signified by Nodes and Internodes?*—That point of the stem where the leaf with its axillary bud is produced, is called the *node*, and the space between two adjacent nodes is called an *internode*.

72. *What will you now say concerning the arrangement of the branches?*—Since they arise from axillary buds, their arrangement

upon the stem will depend upon the arrangement of the leaves. In all *young* plants, at least, they are arranged with much regularity.

73. *What is the general law of arrangement?*—Leaves, and all other appendages of the stem, are arranged spirally, that is, in a line that winds around the axis like the threads of a screw. But to this law there seem to be many exceptions.

74. *Describe the Alternate arrangement.*—When only one leaf arises at each node, the arrangement is evidently spiral, and is called *alternate.*

75. *The Opposite?*—When two leaves arise at one node, they are placed *opposite* to each other, and at *right angles* to the next pair above or below. (Fig. 19.)

76. *The Verticillate or Whorled?*—When three or more leaves arise at each node, they are placed in a circle, and are said to be *whorled.* (Fig. 20.)

77. *How, then, are the branches arranged?*—In like manner, the arrangement of the branches is found to be originally spiral or *alternate* in most plants, *opposite* in the Maple, &c., *verticillate* in the Pine, &c.

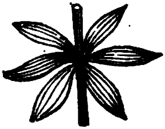


Fig. 20.

§ 3. OF THE SUBTERRANEAN STEM.

78. *What is the stem sometimes called in botanical works?*—The *ascending axis.*

79. *Does every plant have a stem or ascending axis?*—Yes; this part must necessarily exist in every Phænogamous plant (§ 21), but it is very variable in form, position and structure.

80. *Does the stem always reach the surface?*—It has already been stated (§ 55), that although the first tendency of the stem is upward, yet it does not always continue to arise, or reach the surface of the ground. Therefore, stems are classified into AERIAL and SUBTERRANEAN.

81. *Can you here explain the term Acaulescent?*—It means *stemless*, and is used (improperly) to describe such plants as have only subterranean stems; as, the Dandelion, Primrose and Tulip. Such plants were formerly supposed to have no stems at all (See figures)

82. *Enumerate the varieties of the subterranean stem.*—The principal varieties are the bulb, corm, tuber, rhizoma and creeper; all of which are often mistaken for roots.

83. *Describe the bulb.*—The BULB is a kind of subterranean bud, consisting of a very short stem, bearing an oval mass of short, thickened scales above, closely packed in circular rows or layers, emitting a branch or a flower-stem from the axil of one of the scales and roots from the base.

(Fig. 21 is a scale-bulb; 22, the same cut through perpendicularly, showing the inner structure.)

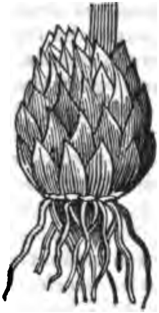


Fig. 21.

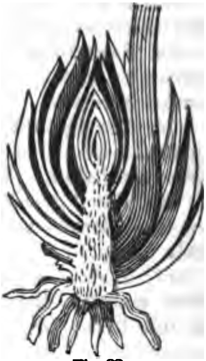


Fig. 22.

84. *The varieties of the bulb.*—The *scaly* bulb consists of many close-packed, over-laying scales, as in the Lily; but in the *tunicated* or *coated* bulb each layer consists of one entire piece enclosing all within it; as in the onion (Fig. 23). But this kind is not common.

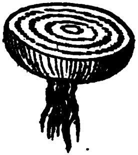


Fig. 23.

85. *What are bulblets?*—BULBLETS are small bulbs formed in the axils of the leaves upon the stem, at length ripening, falling to the ground and rooting, and producing a perfect plant. Such plants are said to be *bulbiferous;* as, the Tiger Lily (Lílium tigrìnum).

86. *A Corm?*—A CORM is the thickened base of a stem, resembling a bulb in form and position, but differing in structure, being *solid*, and not scaly or coated. Example, Indian Turnip (Arum, Fig. 24).

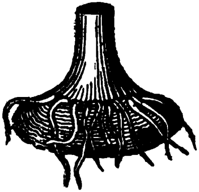


Fig. 24.

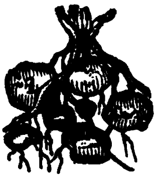


Fig. 25.

87. *A Tuber?*—This is an annual, thickened portion of a subterranean stem, provided with buds (called eyes) from which new plants arise the succeeding year. The potato is an example (Fig. 25).

88. *A Rhizŏma or root-stock?*—It is a prostrate, thickened, rooting stem, either partially or wholly under ground, often furnished with scales which are the rudiments of leaves, or marked with scars which show where leaves once grew, and yearly producing shoots upward and roots downward.

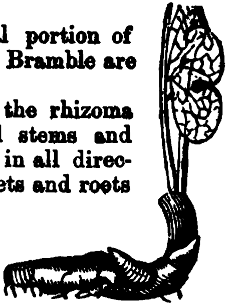


Fig. 26.

89. *Give examples.*—The fleshy, horizontal portion of the Bloodroot (Fig. 26), Sweet Flag, and the Bramble are rhizomas.

90. *Describe the Creeper.*—It differs from the rhizoma only in size, consisting of slender jointed stems and branches, very hardy, extending horizontally in all directions beneath the surface, sending out branchlets and roots at intervals. The Couch-grass (Tríticum repens) is an example.

91. *Of what use are creeping stems?*—They frequently abound in loose, sandy soil, which they bind down and secure against the washing of rivers, floods, and even the waves of the sea.

92. *Give an example.*—The country of Holland, in Europe, is said to owe its existence to certain plants with creeping stems, by which its shores are apparently bound together. Much of the surface of that country is lower than the level of the sea. To prevent inundation, walls of earth, called dykes, have been built, with immense labor, along the coast. These dykes are overgrown by certain Grasses and Sedges, whose innumerable creepers and roots resist the perpetual washing of the waves.

§ 4. OF AERIAL STEMS.

93. *Define the term Caulescent.*—It is derived from the Latin word *caulis*, a stem, and is frequently applied to those plants

which have aerial stems, to distinguish them from acaulescent plants (§ 81).

94. *Enumerate the varieties of aerial stems.*—The culm, runner, scape, vine, trunk, sucker, offset, stolon, and thorn.

95. *Give the definition of a culm.*—A CULM is that form of stem which is peculiar to the Grasses and grass-like plants. It is jointed, and usually green and herbaceous. But this distinction seems hardly necessary.

96. *A Runner.*—This is a prostrate, thread-like (filiform) stem or shoot, extending itself along the surface of the ground, and throwing out roots and leaves at the extremity. The roots strike into the soil, form a new plant which soon becomes independent of the parent; as in the Strawberry (Fig. 27, *a*, *a*).

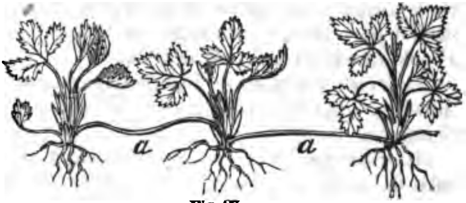


Fig. 27.

97. *A Scape*—This is a flower-stalk, springing from a subterranean stem, and bearing the flowers of the plant but not the leaves; as in the Dandelion, Tulip, Dodecàtheon (See figures).

98. *What of the leaves of such plants?*—They are *radical;* that is, they spring from the root or under-ground stem also.

99. *A Vine.*—It is a stem which, being too weak to stand erect, creeps along the ground, or any convenient support, and does not strike root, like the runner. The vine sometimes supports itself on other plants, &c., either by *tendrils*, as in the Grape, or by twining itself, as the Hop.

100 *What is a Tendril?*—It is a leafless, slender, coiling organ, either formed of a degenerate branch (as in Fig. 28, *b b*), or growing out

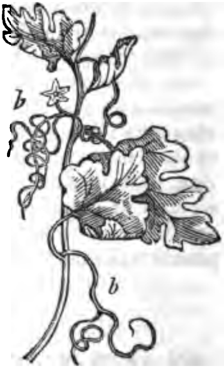


Fig. 28.

of the leaf-stalk, or it may be the extended midvein (§ 158) of the leaf (Fig. 29).

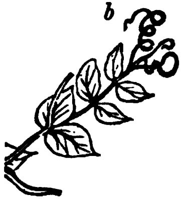


Fig. 29.

101. *Its manner of growth?*—Its first growth is straight, until it meets with some object, when it immediately turns and coils itself about it, and thus acquires a firm, but elastic hold. This beautiful appendage is finely illustrated in the Gourd, and Grape; also in the Pea, where it grows from the ends of the leaves (Figs. 28, 29).

102. *Describe a Twining Vine.*—This stem, having also a very slender form, supports itself on other plants or objects by entwining itself around them, being destitute of tendrils. Thus the Hop-vine mounts into the air by foreign assistance.

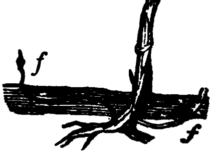
103. *Mention a curious law among twining plants.*—All twining plants of the same species turn and wind in the same direction. If you look through a field of Hops you will find *every* vine winding with the sun, that is, from left to right.

104. *Describe the Trunk.*—This is the name given to the peculiar stems of trees. It is the central column or axis which supports their branching tops. By means of the great strength and firmness of the woody tissue of which it is composed, it long withstands the assaults of the winds.

105. *What can you say of the dimensions of the trunk?*—It often attains to great dimensions. The White Pine of the Northern States, with a diameter of 4 to 7 feet, sometimes reaches the lofty height of 180 to 200 feet, having a trunk straight, erect, and without a limb for two-thirds this height. The Tulip-tree (Liriodéndron) arises 120 feet, with a trunk from 6 to 8 feet in diameter.

106. *What of the duration of trees?*—Some trees attain their growth in a few years, and immediately decay; but, in general, the age of trees is beyond the age of man, and some outlive many generations, as the Oak and Pine.

Fig. 30.



107. *Describe a Sucker.*—It is a branch which springs from a point of the stem which is *beneath* the ground, producing leaves, and

at length striking root from its own base, and becoming an independent plant; as in the Rose (Fig. 30, *ff*).

108. *A Stolon.*—This is a branch springing from the main stem *above* the ground; but bending down, it strikes root in the soil from the apex or some other part, and finally becomes an independent plant. Plants that multiply thus are said to be *stoloniferous.*

109. *A Thorn.*—A *thorn* or spine is a deformed leafless branch, stinted, hardened and pointed, arming the plant as if in self-defence; as seen in the Thorn-bush and Honey Locust. Such plants are said to be *armed*, and other plants *unarmed* (Fig. 31).

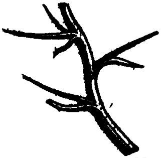


Fig. 31.

LESSON V.

OF THE INTERNAL STRUCTURE AND GROWTH OF STEMS.

§ 1. EXOGENS.

110. Thus far we have been considering only the outward forms and features of stems. Let us now take notice of their internal structure. But as our young readers are not now prepared to enter upon a *thorough* examination of this subject, we shall omit every thing except what is necessary to aid them in distinguishing the two great subdivisions of Flowering Plants, called the Exogens and the Endogens.

111. *Now let us hear a general definition of the Exogens.*—The Exogens are those plants which grow by the addition of new matter made upon the *outside* of the wood annually.

112. *Give examples.*—All the trees and the greater part of the shrubs and herbs of temperate and cool climates are Exogenous Plants.

113. *Give a general definition of the Endogens.*—The Endogens are those plants whose stems grow by the introduction of the new wood into the interior of the old.

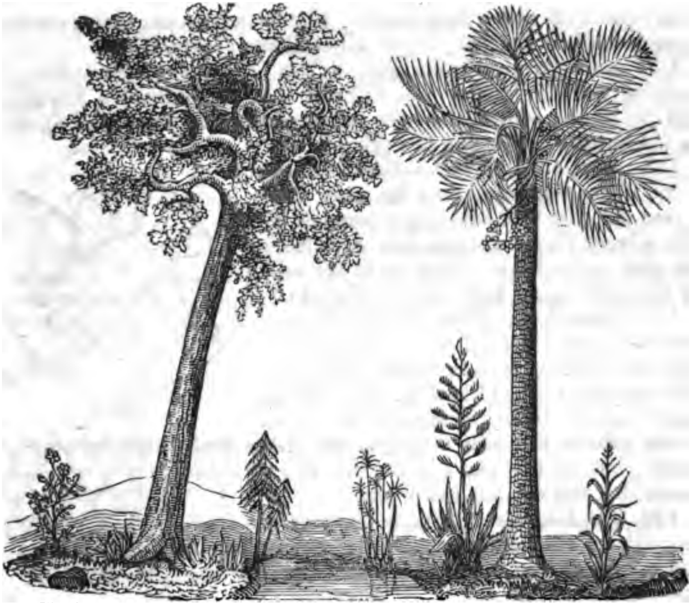


Fig. 32. Exogens—*Oak, Fir, &c.* Fig. 33. Endogens—*Palm, Agave, &c.*

114. *Give examples.*—All the Grasses and Sedges, and all bulbous plants in temperate climates, and all Palms and Canes of warm climates, with one or two shrubs in cool climates are Endógenous Plants.

115. *How shall we best examine the internal structure of the stem?*—By cross sections.

116. *Please explain your meaning.*—A cross-section is made by cutting the

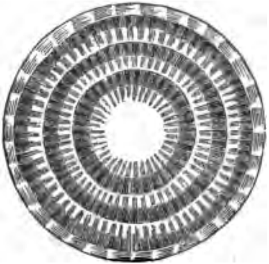


Fig. 34.

stem square off with a keen knife. Fig. 34 represents such a cutting or section of an Exogen; as, an Elm, Cherry, Rose, Birch.

117. *State the three main parts of an Exogenous stem.*—On examining such a section, you will see that it contains a roundish *pith* (*a*) in the centre, then one or more rings of *wood* (*d d d*), and on the outside a covering of bark (*b*).

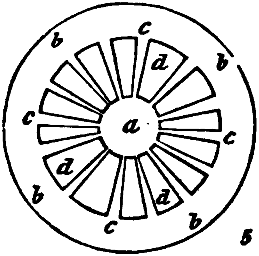


Fig. 35.

118. *State a fourth part.*—Besides these parts, if the stem examined be more than a year old, you will see also a number of fine, silvery lines, running like rays from the pith to the bark. These rays are called the MÉDULLARY RAYS (*c c c c*, Fig 35).

119. *Describe the Pith.*—The pith occupies the central part of the stem, and consists of a light, porous tissue, which we call cellular tissue (Fig. 36), or a tissue consisting of little, roundish cells. In young plants the pith is large, and filled with fluids; but as the plant grows old, the pith becomes dry and diminished in size.

120. *The Médullary Rays.*—These extend from the pith to the bark, through the woody layers, and consist of thin plates of cellular tissue, of the same origin as the pith.

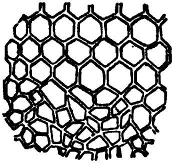


Fig. 36.

Fig. 37.

121. *How may these rays be best exhibited?*—By splitting a billet of Oak or Maple in the same direction with them. They are often called the *silver grain.*

122. *The Wood.*—The wood is composed of circular layers or hollow cylinders, one within another, penetrated by the medullary rays. It consists of firm tissues of several kinds, but chiefly of what is properly called *woody tissue.*

123. *Can you give any farther account of this kind of tissue?*—Here is a representation (Fig. 37) of a small portion of woody tissue, greatly magnified; it appears to be made up of lengthened cells, wrought into string-like fibres.

124. *How is the age of the tree indicated, and why?*—The

pith and the inner layer are the first year's growth. One new layer is formed each successive year during the life of the plant. Hence the whole number of layers, if counted near the ground, will show the *age* of the tree.

125. *Will you describe the Albúrnum?*—The outer and newer layers constitute that part of the wood which is called the *sap-wood*, *white-wood*, or, more properly, the albúrnum. This is usually softer and of a lighter color than the rest of the wood, and it is through the tubes and vessels of these layers alone that the sap ascends.

126. *And also the Durâmen?*—As these layers become old, their vessels are gradually filled with solid matter, until they can no longer admit fluids to pass through them. Thus the DURÂMEN or *heart-wood* is formed, which is more firm, durable and useful in the arts.

127. *How does it appear that the durâmen is not necessary to the life of the tree?*—We often notice trees in the forest whose durâmen has rotted and disappeared, leaving the trunk hollow, while they are still as vigorous and flourishing as ever.

128. *Just mention the three coats which compose the Bark?*—The bark consists, 1st, of the *epidérmis* (§ 9) enclosing the whole vegetable; 2d, the *green* or *corky bark;* and, 3d, the *white bark* within, called the *liber*, which is easily separated from the wood.

129. *When and where is a new layer formed?*—At the end of the spring, between the bark and the wood.

130. *Can you describe the process?*—A portion of the sap, now thickened and changed in the leaves, as it descends is poured out between the liber and the wood, forming a new layer upon each. First, new cells like those of the pith are formed (§ 119), and immediately new tubes and fibres of woody tissue, commencing at the leaves, grow downward through the cellular matter, and complete the layers.

131. *State, in brief, the principal office of the stem.*—Its principal office is, to convey the sap from the roots to the opposite extremities of the plant. This takes place through the tubes and woody fibres of the alburnum, which extend even to the leaves.

§ 2. OF THE ENDOGENOUS STRUCTURE.

132. *Will you briefly describe the structure of Endogens?*—In the endogenous stem there is no distinction of pith, wood and bark; neither does a cross section (§ 116) show any appearance of annual layers.

133. *Of what is their substance composed?*—The substance of these stems is composed of the same materials as that of Exogens; that is, of cellular tissue, woody fibre, &c.: but the former exists equally diffused throughout all parts of the stem, and the rest are imbedded in it, in the form of little bundles of fibres. (See Fig. 38, which represents a cross-section of an Endogenous stem.)

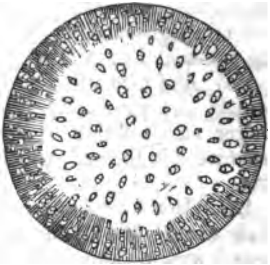


Fig. 38.

134. *How do the new bundles grow?*—These bundles of wood, resembling threads, commence at the leaves and grow downward, penetrating through the midst of the cellular substance of the stem; so that the *central* portions of endogenous stems will always be found to be the *newest*.

135. *Point us to some examples of Endogens.*—The Green Brier is a northern, and the Palm is a southern example of woody Endogens, and the Broom-corn is a fine example of an herbaceous Endogen.

LESSON VI.

THE LEAF.

136. *How would you characterize the leaf?*—The LEAF constitutes the verdure of plants, and is the most conspicuous and beautiful object in natural scenery.

137. *What say you, in general, of its form?*—It has a thin and expanded form, presenting the largest possible surface to the air and light.

138. *What is the color of the leaf?*—The leaf is almost universally *green*, which, of all colors, is the most agreeable to the eye; but it varies by almost infinite shades, and is often finely contrasted with the more delicate tints of the flower.

139. *Have you noticed their autumnal hues?*—Yes. Toward the end of the season, their *verdure* is changed, often to the most brilliant colors, as crimson, scarlet, orange, yellow, decking the forests in wonderful splendor.

§ 1. ARRANGEMENT AND POSITION.

140. *What is related of their arrangement upon the stem?*—In the bud, their arrangement is nearly or quite *circular*, but by the lengthening of the axis into a stem or branch, this arrangement is changed in various ways.

141. *What is the Alternate arrangement?*—It is where the leaves are placed one above another, on different sides of the stem, only one at each node (§ 71); as in the Elm, Willow, Butter-cups.

142. *The Opposite?*—Two leaves at the same node, placed over against each other; as in the Maple, Hydrangea, Sage.

143. *The Verticillate or Whorled?*—More than two at the same node, placed in a circle; as in the Meadow Lily.

144. *Fasciculate or Tufted?*—In crowded whorls or spirals; as in the Water-starwort.

145. *Radical leaves?*—This term refers to the position of the leaves upon the plant. Those leaves which grow out of the stem at or just beneath the ground so as to appear as if they grew out of the *root*, are called *radical* (See figures).

146. *Cauline and ramial?*—*Cauline* leaves grow from the stem (caulis) above ground, and *ramial* grow from the branches (rami).

§ 2. STRUCTURE.

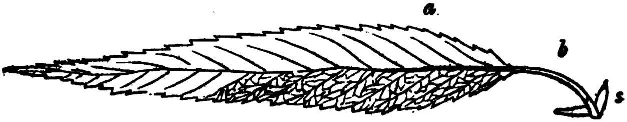


Fig. 39, A Willow Leaf.

147. *Please define, carefully, a leaf.*—A leaf may be regarded as a portion of the two outer coats (§ 128) of the bark, extended into a broad, thin expansion by means of a woody frame-work or skeleton proceeding from the interior of the stem. This broad, thin part is called the LAMINA OR BLADE of the leaf (*a*, Fig. 39).

148. *How is the leaf supported?*—Usually by a foot-stalk, which we call the PETIOLE (*b*, Fig. 39), and the leaf is then said to be *petiolate.* But the petiole is often wanting, and the leaves stand directly upon their base. They are then said to be *sessile.* (In Fig. 39, *s* represents *stipules.*)

149. *What is the usual form of the petiole?*—Slender and nearly cylindrical, with a groove upon the upper side—sometimes quite cylindrical.

150. *Define a Compressed Petiole.*—The petiole is said to be *compressed* when it is flattened sideways or vertically, so as to be agitated by the slightest breath of air; as, the Aspen or Poplar. Such leaves can scarcely be at rest in any position.

151. *A Winged Petiole.*—A winged petiole is expanded sideways or horizontally into a border or margin; as, the Lemon, Orange.

152. *A Sheathing or Ampléxicaul Petiole.*—This kind is expanded at the base into a margin which surrounds and embraces the stem; as in the Angelica, Caraway, and all others of the Umbelliferæ.

153. *Can you state the general form of the lamina?*—The lamina has generally a rounded outline, longer than wide, with equal sides but unequal ends. That end next the petiole or the stem is the *base*, and the other is the *apex.*

154. *Can you distinguish the Simple and the Compound Leaf?*—A leaf is simple when its blade consists of *a single piece*, however cut,

cleft or divided it may be; and *compound* when it consists of *several distinct blades*, supported by as many branches of a *compound petiole.* See the Rose leaf and the Clover leaf for examples.

§ 3. VENATION OF THE LEAF.

155. *Give an account of the frame-work, or skelston of the leaf.*—It consists of all those branching vessels of the petiole which we see running throughout the blade, in all directions. Speaking of them collectively we call them VEINS, because, like veins in animals, their office is to convey the nourishing fluids.

156. *Will you define the word venation?*—*Venation* is a term denoting the manner in which the veins are divided and distributed.

157. *Let us hear you classify the veins.*—They are divided into four kinds, differing from each other only in size and position, called the *midvein*, *veins*, *veinlets* and *veinulets*.

158. *Describe the midvein and the veins* (*v*).—The MIDVEIN is the chief prolongation of the petiole, running directly through the blade, from the base to the apex, as we observe in the leaf of the Willow, Elm and Magnolia (Fig. 39, *m*). If there be several similar divisions of the petiole, radiating from the base of the leaf, as we see in the Maple and Cotton plant, we call them all VEINS, and the leaf is said then to be *three-veined*, *five-veined*, &c.

159. *What are the Veinlets?*—The principal branches sent off from the midvein or veins. See them in the birch leaf, running straight to the teeth.

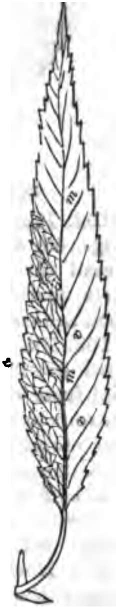
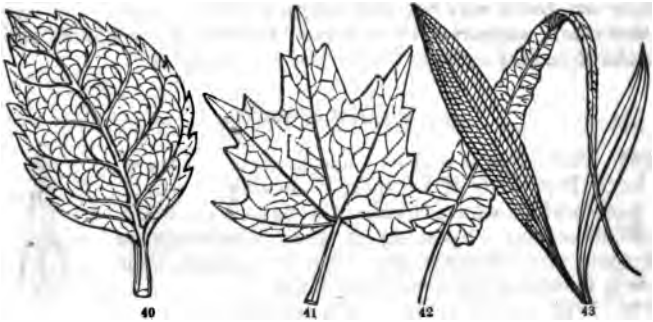


Fig. 39.

160. *What the Veinulets?*—These are the branches sent off from the veinlets. See them in this figure (39, *a*).

161. *Is there more than one mode of venation?*—There are three, and they are severally characteristic of three great divisions of the Vegetable Kingdom.



FORMS OF VENATION.—40, 41, Exogens; 43, Endogen; 42, Acrogen.

162. *Please mention the first mode.*—It is the *reticulate* or *net-veined*, (Figs. 40, 41,) where the veins all branch and subdivide as they spread through the leaf in all directions, and the fine branchlets unite again so as to form a net-work of veinulets all over the leaf. Such are the leaves of the Exogens generally (§ 111).

163. *The second mode.*—The *parallel-veined* venation (Fig. 43), in which the veins are all parallel with each other (whether they proceed from the base of the leaf to the apex, or are sent off from the midvein to the margin), and are connected by simple veinlets running crosswise. Such are the leaves of nearly all the Endogens, as the Grasses, Canes, Tulip.

164. *The third mode.*—The *fork-veined* (Fig. 42), where the veins all divide and subdivide by forked divisions which do not unite again. Such are the leaves of the Cryptogamia generally.

165. *How do you classify the net-veined leaves?*—Into two forms, namely, the *feather-veined* and the *radiate-veined*.

166. *Describe the first.*—The *feather-veined* leaf (Figs. 39, 40) is one in which the venation consists of a midvein, giving off, at intervals, veinlets from each side, and branched veinulets; as in the Beech, Pawpaw, Magnòlia.

67. *Describe the second.*—The *radiate-veined* leaf (Fig. 41) is one in which the venation consists of several veins (§ 158) of nearly

equal size, radiating from the base of the leaf to the margin, each with its own system of veinlets and veinulets. The Maple, Crowfoot, Cotton, afford good examples.

§ 4. FORM OR FIGURE.

168. *Will you enumerate the various forms of the feather-veined leaves, beginning with such as have the middle veinlets longest?*

1. *Orbícular* or roundish; as in several species of Pyrola (Fig. 44).

2. *Ellíptical* or oval; as in the Checker-berry (Gaultheria) (Fig. 45).

3. *Oblong* or narrow-oval; as in Arenaria lateriflora (Fig. 46).

169. *Enumerate three forms which have the lower veinlets longer than the rest.*

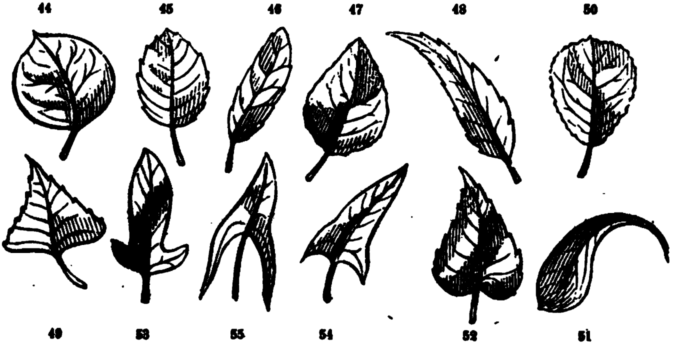
4. *Deltate;* triangular or three-sided, like the Greek letter *delta* (Fig. 49).

5. *Ovate* or egg-shaped; as in the False Syringa (Fig. 47).

6. *Lánceolate*, or lance-shaped; narrow and tapering to each end; as in Sweet-william, Smart-weed (Fig. 48).

170. *Mention two forms in which the upper veinlets are the longer.*

7. *Obòvate*, or inversely egg-shaped, having the upper end broader than the lower; as in the Walnut (Fig. 50).



Figures of feather-veined leaves.

8. *Spátulate*, shaped like a spatula; as in the Daisy (Fig. 51).

171. *Enumerate five in which the lower veinlets are the longer, sending off veinulets backward.*

9. *Cordate* or heart-shaped, like the ovate form, with a sinus or hollow at base, as in the Lilac (Fig. 52).

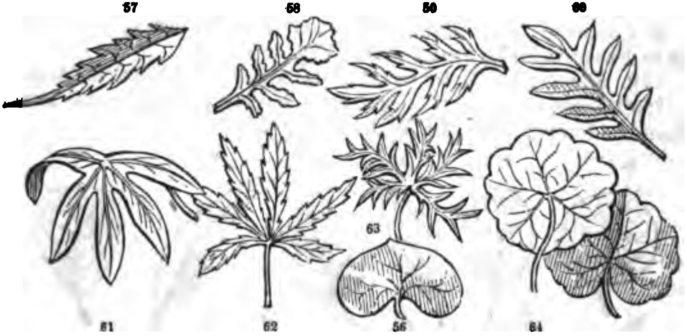
10. *Auriculate*, having ear-shaped lobes at the base; as in Sorrel (Fig. 53).

11. *Hastate*, hollowed out at the base and sides; as in Bitter-sweet (Fig. 54).

12. *Ságittate*, arrow-shaped, with pointed, descending lobes at base; as in Sagittaria, and Scratch-weed (Fig. 55).

13. *Réniform*, kidney-shaped, broad, rounded at the apex and hollowed at base; as in Asarum or wild-ginger (Fig. 56).

172. *Can you now describe four forms which result chiefly from a deficiency of tissue between the veinlets?*



56—60, Figures of feather-veined leaves, the remainder of radiate-veined.

14. *Rúncinate*, lion-toothed, having the margin divided into large tooth-like segments which point backward, as in Dandelion (Figs. 57, 65).

15. *Lyrate*, with several deep, rounded sinuses or hollows in the tissue between the lower veinlets, as in Winter Cress (Fig. 58).

16. *Pinnátifid*, or feather-cleft, with deep sinuses between the

veinlets, dividing each side of the leaf into oblong segments; as, Pepper-grass (Fig. 59).

17. *Sinuate*, having deep, rounded openings between the veinlets, as seen in the leaves of White Oak (Fig. 60).

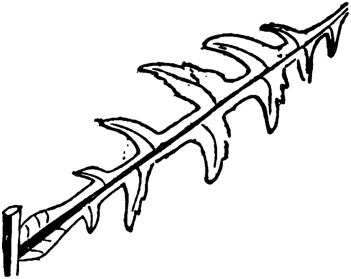


Fig. 65, Leaf of Lactuca elongata, or Wild Lettuce.

173. *Will you now describe some of the forms which radiate-veined leaves assume, commencing with the*

18. *Palmate?* — Hand-shaped, having five veins with as many lobes separated by deep divisions, so as to resemble the palm of the hand with the fingers extended. Ex. Passion-flower (Fig. 61).

19. *Lobate or lobed?*—When the divisions between the veins are shallow, the leaf is said to be merely three-lobed, five-lobed, &c. Ex. Maple (Fig. 41).

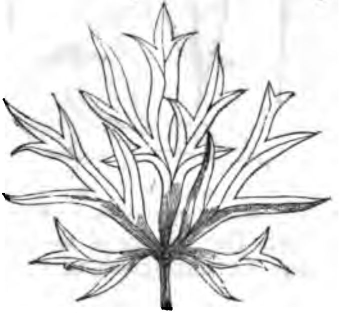
20. *Digitate?*—Finger-shaped, having narrow segments very deeply divided; as in the Hemp (Fig. 62).

21. *Pedate?*—Foot-shaped; the same as the palmate, except that the two lateral lobes are themselves subdivided; as in the Pæony.

22. *Laciniate?* — Gashed; the veins and veinlets separated, as if the blade were cut and gashed with scissors. Ex. Butter-cups (Figs. 63, 66).

23. *Peltate?*— Shield-form; the veins radiating from some point in the *midst* of the blade, where also the petiole is inserted. Ex. Tropæolum (64).

174. *What other forms already described may also result from radiate venation?* — Reniform, broad-cordate, broad-ovate, &c.



66, Leaf of Monk's Hood.

175. *Parallel-veined leaves are less diversified in form than the preceding classes; will you enumerate some of them, as the*

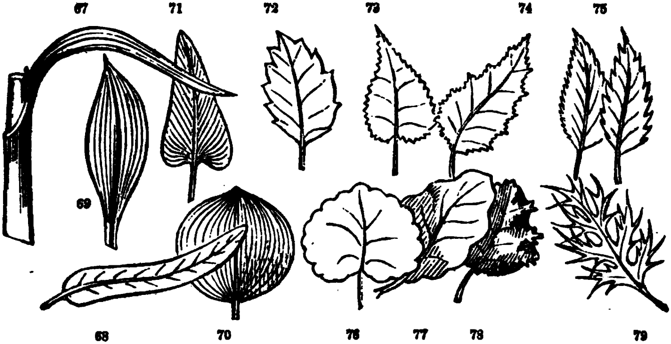
176. *Linear?*—When the veins and fibres are straight, forming a very narrow leaf, as grass leaves generally. This form also occurs in feather-veined leaves, when the veinlets are all very short, as in the Snap-dragon (Figs. 67 and 68).

177. *When will a parallel-veined leaf become oval, or lanceolate, or oblong, or some such form?*—When the veins are curved, Ex. the Orchis (Figs. 69, 70).

178. *When Cordate?*—When the lower veins are curved backward and then upward, as in Pickerel-weed; and *ságittate* when the lower veins are directed downward, as in Sagittaria.

179. *Acerose?*—Needle-shaped; when there is little or no distinction of blade, petiole or veins; as in the Pine.

§ 5. MARGIN.



68, a feather-veined leaf; 67, 69, 70, 71, parallel-veined; 72—79, margins of leaves.

180. The margin of the leaf affords also many excellent characters for distinguishing plants. *What form of margin is said to be*

181. *Entire?*—The even-edged; owing either to the full growth of tissue between the veinlets, as in the Lilac, or owing to a vein

running along close to the margin; as in the Myrtle, Lily, &c., (Figs. 44, 56, 71, &c.).

182. *Dentate?*—Toothed; the tissue incomplete, having teeth with concave edges, pointing outward from the centre, as in the Circæa, Hawkweed (Fig. 72). If the teeth are very fine, the margin is called *denticulate* (Fig. 73). If the teeth themselves are toothed, it is *doubly-dentate* (Fig. 74).

183. *Serrate?*—Having sharp teeth pointing forward, like saw-teeth; as in the Rose. If the teeth are very small, the leaf is *serrulate*. If the teeth are themselves toothed, it is *doubly-serrate* (Fig. 75).

184. *Crenate?*—Notched with rounded or convex teeth, as in the Ground Ivy. If such notches are very small, it is *crenulate* (Fig. 76).

185. *Erose?*—Gnawed; having the margin irregularly toothed or jagged, as if bitten by animals.

186. *Undulate?*—Wavy; the margin alternately convex and concave, like waves, as in the Amaranths (Fig. 77).

187. *Spinous?*—When the veins and veinlets project beyond the tissue in sharp spines, as in the Thistle. Such leaves are said to be *armed*, and the opposite term is *unarmed* (Fig. 79).

188. *Incised?*—Cut; the margin cleft or divided as if cut with scissors.

189. *Laciniate?*—Torn; the margin divided by deep, irregular gashes.

190. *Crisped?*—The margin much expanded and curled by an excess of tissue; as in the Crisped Mallow, Cabbage (Fig. 78).

191. *Repand?*—Having the margin slightly concave between the projecting veinlets, like the edges of an umbrella.

§ 6. APEX.

192. *In regard to the termination of the leaf at the apex, when is it said to be acute?*—When it ends with an angle, as in Checker-berry.

193. *Obtuse?*—When it ends with a rounded point, as in St. John's-wort.

194. *Acùminate?*—When it ends with a long, tapering point, as in Birch.

195. *Emárginate?*—Having a notch at the end, as in White Clover.

196. *Mùcronate?*—Abruptly ending in a short, hard, bristly point, as in Sweet Clover.

§ 7. SURFACE.

197. There are many useful terms in botany, relating to the qualities of the surface (or epidermis, § 9) of the leaf, which are, however, equally applicable to the stem and all other organs. *Will you define the term Glabrous?*—It means smooth, denoting the absence of all hairs or bristles, as in Hydrangea. Those plants which live in moist or wet soils are mostly glabrous.

198. *Pubescent?*—Covered with soft, downy hairs, as in the Fly-honeysuckle.

199. *Scabrous?*—Rough with hard, short, even points, as in Borrage.

200. *Pilose?*—With short, weak, thin hairs, as in Blue-curls.

201. *Hoary?*—White with very short, dense hairs, as in Life-everlasting.

202. *Villose?*—Clothed with long, thin, shaggy hairs, as in Solidago altissima.

203. *Woolly?*—With long, dense, matted hairs, as in Mullein.

204. *Tomentose?*—With dense, short and woolly hairs, as in Hardhack.

205. *Rugose?*—Wrinkled; the tissue between the netted veins convex and concave, from its excess, as in Sage.

§ 8. COMPOUND LEAVES.

206. *Please repeat, once more, the definition of a compound leaf* (See § 154).

207. *And what do you call the divisions of a compound leaf?*—LEAFLETS; and the same distinctions of outline, margin, &c., occur in them as in simple leaves.

208. *Let us now hear you describe those forms of the compound leaf which result from the feather-veined arrangement, beginning with the*

209. *Pinnate.*—Winged; where the midvein (that is, the petiole) bears a row of leaflets on each side, generally opposite and equal in number, as in Locust-tree, Cassia (Fig. 80).

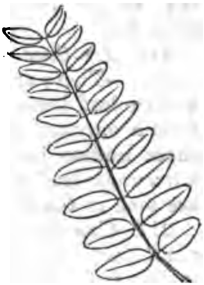


Fig. 80, Cassia.

210. *Mention some varieties of the pinnate leaf.*—It is *unequally pinnate* where it ends with a single leaflet, as in the Rose (Fig. 81); *equally pinnate* where it ends with a pair of leaflets, as in Cassia (Fig. 80); and *cirrhose* when it ends with a tendril, as in the Pea (Fig. 82).

211. *What of the number of the leaflets?*—A pinnate leaf sometimes consists of as many as 20 or 30 pairs of leaflets, as in the Milk-vetch, and Cassia; while in the bean and many other plants there are but 3, and we call such leaves *trifoliate*, or ternate.

212 *Can you point out an important distinction in trifoliate leaves?*—Yes. Where the lateral leaflets are attached to the petiole a distance below the end, as in the garden beans, or the Desmodia (Fig. 83), it is *pinnately-trifoliate;* and where the three leaflets are all nearly or quite sessile, as in the Clover or Baptisia (Fig. 84), it is *palmately trifoliate.*

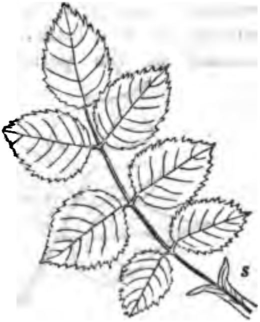


Fig. 81, Rose.

213. *Describe the Bipinnate leaf.*—Twice pinnate; formed where each leaflet of a pinnate leaf becomes itself pinnate, as in Shield Fern, Fumitory.

214. *A Tripinnate leaf.*—Thrice pinnate; formed when the leaflets of a bipinnate leaf become again pinnate, as in the Poison Hemlock (Fig. 86).

215. *What remarkable feature do we observe in the Honey Locust and in the Coffee tree?*—We frequently find leaves on these trees with

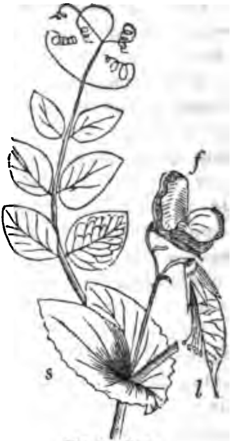


Fig. 82, Pea.

all these three degrees of division, namely, pinnate, bipinnate and tripinnate, curiously combined; showing the gradual change from the simple to the most compound leaf (Fig. 85).

216. *Are there similar divisions in ternate leaves?*—There are. Where the leaflets of a ternate leaf become themselves ternate, they form a *biternate* leaf of 9 leaflets, and where these leaflets become again ternate we have a *triternate* leaf of 27 leaflets. Both kinds are seen in the Baneberry (Actea).

217. *Can any of the forms above mentioned result from radiate venation?*—Yes, the palmately trifoliate (Clover).

218. *Describe other forms peculiar to radiate venation; and first the Quinate.*—This form consists of five leaflets, all attached to the summit of the petiole, as in Cinquefoil. When there are seven such leaflets, the leaf is called *septinate;* nine, *nine-foliate;* as in Lupine (Fig. 87), and Horse-chestnut.

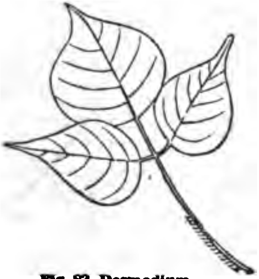


Fig. 83, Desmodium.

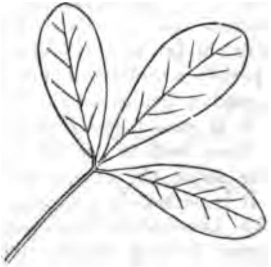


Fig. 84, Baptisia leucantha.

219. We will now notice such terms as have regard to the insertion of the leaf. *What is the Amplexicaul leaf?*—A leaf whose base at its insertion, embraces or surrounds the stem (Fig. 88).

220. *The Perfòliate leaf?*—It has the base lobes completely united around the stem, so that the stem seems to pass *through* the lamina, as in the perfoliate Bellwort (Fig. 89). The *connate-perfòliate* is where two opposite leaves are thus united at their bases around the stem, as in Bone-set (Fig. 90).

221. *The Decúrrent leaf?*—It has its base lobes growing to the stem below the point of insertion, so that the leaf seems to *run downward*, as in the Mullein (Fig. 91). The *stellate* are the same as *whorled* (§ 76).

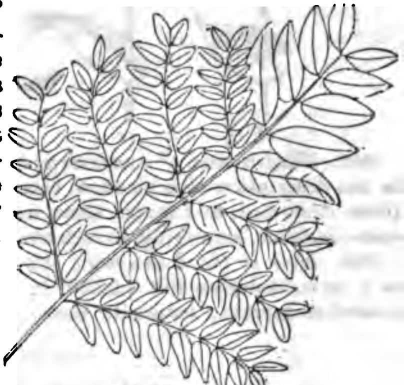


Fig. 85, Honey locust.

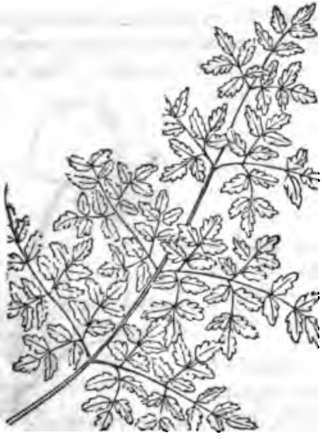


Fig. 86, Poison Hemlock

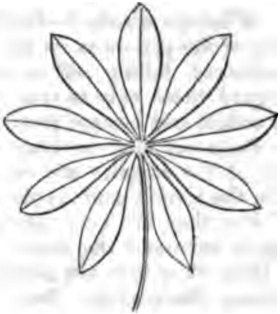
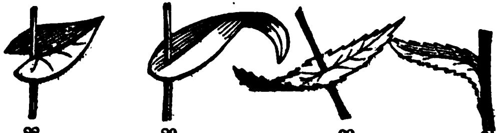


Fig. 87, Lupine.



222. *What is said of double terms?*—It is often found necessary, in the description of a plant, to combine two or more of the terms above described, to express some *intermediate* form or quality; as *ovate-lánceolate*, signifying *between* ovate and lanceolate, &c.

223. *How is the Latin word* SUB (*under*) *used?*—It is prefixed to a term to denote the quality in a *lower degree;* as *sub*serrate, somewhat serrate; *sub*sessile nearly sessile.

LESSON VII.

STIPULES AND BRACTS.

224. *What are stipules?*—Certain leaf-like expansions situated on each side of the petiole at its base. They are sometimes mere scales or membranes, falling off as soon as the leaf expands; but we shall regard those only as true stipules which remain awhile and become green.

225. *Point out some varieties.*—In the Rose (Fig. 81, *s*) the stipules are *adnate* to the petiole; in the Cotton and Apple they are *free;* in the Pea they are very large (Fig. 82, *s*), seeming to surround the stem; in the garden Violet (Fig. 92 *s*) they are much cleft; in the Knot-grass, Buck-wheat, they form a sheath around the stem above the leaf-stalk, called *òchrea.*

226. *Explain the terms derived from stipules?*—Plants which are furnished with true stipules are called *stipulate*, while those which have none are *exstipulate.*

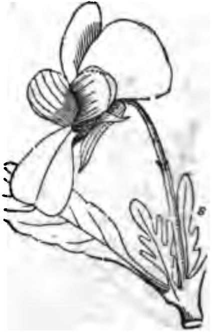


Fig. 92. Viola tricolor.

227. *What are Bracts?*—Those half-formed leaves which are often seen upon the flower stalks and near the flowers. They are sometimes colored like the flowers, as in Painted-cup, and Balm. They have received various names, according to their situation and arrangement.

228. *When do they constitute an Involùcre?*—When they are arranged in a whorl, and surround a cluster of flowers or flower-stalks. In the Corneil the involucre is white, like a corolla. In the umbelliferous plants there is commonly an involucre; as, Carrot, Poison Hemlock (Conium). Fig. 93, *a*.

229. *What have you learned concerning the involucre of the Asterworts?*—Taking, for an example, the Dandelion or the Sunflower, I find many bracts growing closely around each head of flowers, forming an involucre which appears like a calyx (see these heads described in § 253).

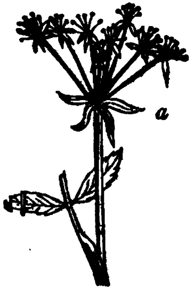


Fig. 93.

230. *What of the bracts in the grasses?*—In the grasses I find numerous bracts, which are here called husks or chaff, but more properly, *glumes.* To these glumes (in the Wheat, for example) long awns or beard is attached.

231. *Do you think that glumes are transformed leaves?*—Undoubtedly. The sheath of the leaf corresponds to the glume, and the blade to the awn.

§ 1. DURATION.

232. *State the distinctions of leaves, stipules, &c., in respect to duration.*—Such as are *fugàcious*, fall early, before the end of summer: the *deciduous* endure through the season, and fall off in autumn: the persistent or *evergreen* remain through all seasons, retaining their color, until the new leaves of the following spring appear, so that the plant is always verdant. On account of these differences, plants are classed as *deciduous* and *evergreen.*

LESSON VII-I.

INFLORESCENCE.

233. *Can you tell me what parts of the plant we have hitherto considered?*—Those parts only which serve for the nourishment and support of the plant itself, namely, the root, stem and leaves.

234. *What are the parts next to be considered?*—Those parts which serve the purpose of continuing and multiplying the species after the individual has perished, namely, the flower and fruit.

235. *What have you learned as to the origin of the flowers?*—At a certain season, varying in different plants, some of the buds which might have been formed into leafy branches, are transformed into flowers, in the fulfilment of the Divine command in Genesis, 1st chap. 11th verse: "And God said, Let the earth bring forth grass, the herb yielding seed *after its kind*, and the fruit-tree yielding fruit, whose seed is in itself."

236. *What is the meaning of the term Inflorescence?*—It denotes the arrangement of the flowers upon a stem or branch.

237. *What is said of the position of the flowers upon the stem?*—Since we regard the flower-bud as only a transformed leaf-bud, its position, like that of the leaf-bud, must always be either terminal or axillary.

238. *Will you define the terms Terminal and Axillary?* (§ 66, 67.)

239. *Is there no other position of the inflorescence?*—In a few plants, as in the potato tribe, it is situated *above* the axils and nearly opposite the leaves, that is, it is *supra-axillary*.

240. *What is the Péduncle?*—It is that part of the stem on which the flowers are immediately situated. When the peduncle is wanting, the flower is said to be *sessile*.

241. *Will you give an account of the Pedicels?*—The peduncle may be either *simple* or *branched*. If it be simple, it bears only one flower; but when it is divided into branches, it bears several flowers, and its final divisions, each bearing a single flower, are called PÉDICELS.

242. *Will you define a Scape?*—The scape is a flower-stalk which springs from a subterranean stem (§ 56) in such plants as are said to be acaulescent (§ 81). Ex. Dándelion, Tulip, Hyacinth. The scape may also be either simple as in the Dáffodil, or branched as in the American Cowslip.

243. *Define solitary inflorescence.*—It consists of a single, terminal flower, as in the Tulip; or it is so called when but a single axillary flower is produced at the same node (§ 71); as in the Morning-glory and Petúnia.

244. *You may now define the various modes of inflorescence, in the order in which I shall mention them; and first, the Spike.*—This form of inflorescence consists of several sessile flowers arranged along a common peduncle (or *rachis*); as in the Mullein and Plantain and some grasses (Fig. 105).

245. *What do you understand by the term Rachis?*—It means the main part, or axis of the peduncle, which supports the sessile flowers or pedicels.

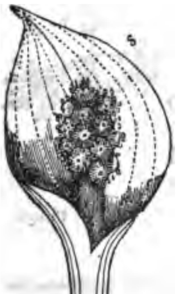


Fig. 94, Calla palustris.

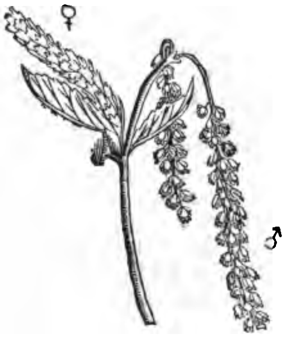


Fig. 95, White Birch.

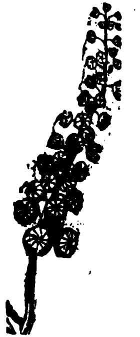


Fig. 96, Phytolacca.

246. *The Raceme?*—This is the same as the spike, except that the flowers (or fruit) are raised on pedicels, each in the axil of a bract, and blossoming in succession from the base upward. Ex. Pyrola, Hyacinth, Currant, Poke (Fig. 96).

247. *The Ament, or catkin?*—It is a spike of naked, scaly flowers, which all fall off together, not separating from the rachis; as in the Birches, Willows, Poplars. Such plants are called *amentàceous*. (Fig. 95.)

248. *The Spadix?*—This is also a spike with a fleshy rachis, often enveloped in a large bract (*s*), called *Spàthe;* as in the Indian turnip, and Calla (Fig. 94).

249. *The Corymb?*—This differs from the raceme in having the lower pedicels so lengthened as to elevate all the flowers to nearly or quite the same level, as in many of the Spiraèas and Thorns. (Fig. 104).

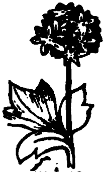


Fig. 93.

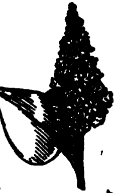


Fig. 97, a Thyrse.

Fig. 99, Grass.

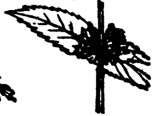


Fig. 100, Verticil.

250. *The Umbel?*—Differs from the corymb in having the pedicels all springing from the *same point* in the common peduncle, and all of about equal lengths, like the stays of an umbrella, as the onion, milkweed, garden cherry. (Fig. 101.)

251. *Difference between a Simple and a Compound umbel?*—The simple umbel is that already described; and a *compound umbel* is such as would be formed were each pedicel of the simple umbel to bear an umbel instead of a single flower; as in Caraway, Fennel. Here we call the little umbels *umbellets*, and their stalks *rays*. (Fig. 93.)

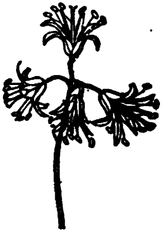


Fig. 101, Umbel.

(In the same manner we also explain the *compound corymb*, *compound raceme*, &c.)

252. *The Head or capitulum?*—It is similar to an umbel, but the flowers are sessile, or nearly so, upon the summit of the peduncle, in a dense mass; as, Teazel, Clover, Button-bush, Erýngium. (Fig. 100.)

253. *Please describe carefully the Head in the Compositæ.*—In this

vast family, the *heads* (once called *compound flowers*) bear a general resemblance to single flowers. But when we examine such a head (for example, of an Aster, or Sunflower, or Mayweed), we see that it consists of many little distinct flowers, crowded together upon the broad summit of the peduncle (called the disk or RECEPTACLE.)

254. *Explain the parts of this kind of head.*—What seem to be the petals are the *rays*, and what seems the calyx is the involucre (§ 228). The outer circle of flowers which bear the rays are called the *ray-flowers*, the others the *disk-flowers*.

255. *Distinguish between the radiate, radiant, and discoid heads.*—Where the ray-flowers only are *ligulate* (see § 287), as in Sunflower, the head is *radiate;* where the ray and disk-flowers both are ligulate, as in the Dandelion, it is *radiant;* and where none of the flowers are ligulate, as in the Tansey, it is *discoid.*

(*a. What is the meaning of the term Radiant when applied to an umbel, a corymb, or a cyme* (§ 258)?—It implies that the corymb, cyme, &c., is surrounded by a circle of flowers whose petals are larger than the rest, more showy, and usually (but not always) with no stamens or pistils; as in the Candytuft, Coriander, Hydrangea and Viburnum.)

256. *What is a Panicle?*—The panicle is a compound inflorescence, formed by an irregularly branching peduncle, as in the Oats, Asters, Phlox (Fig. 99).

257. *A Thyrse?*—This is similar to the panicle, except in being more compact and of an egg-shaped form; as, the Lilac, Horse-chestnut (Fig. 97).

(All these forms of inflorescence may be classified as *axillary*, since they result from axillary flowers in some form or other. The following forms result from terminal flowers, and may be classed as *terminal*.)

258. *Describe the Cyme.*—This inflorescence has the general appearance of a corymb, but is remarkably distinguished by its branches being repeatedly 2-forked and 3-forked, and by its central flowers blossoming first; as seen in the Elder, Hydrángea, Chick-weed (Fig. 102).

259. *A Fáscicle.*—This is a sort of cyme in which the flowers are crowded and nearly sessile; as in the Sweet-William and other Pinks (Fig. 103).

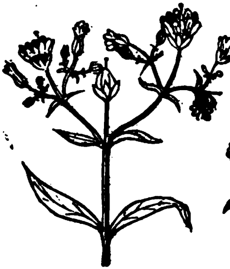


Fig. 102, Cyme.

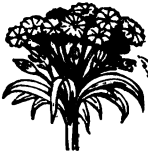


Fig. 103, Fascicle.

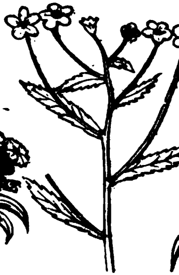


Fig. 104, Corymb.

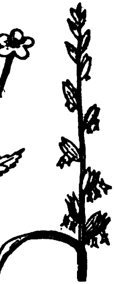


Fig. 105, Spike.

260. *A Vérticil.*—This term is applied to those reduced cymes which are peculiar to the Labiatæ (as Catmint, Motherwort, Hemp-nettle), where two such cymes occupy the opposite axils at each node, and appear to be *whorled.* (Fig. 100).

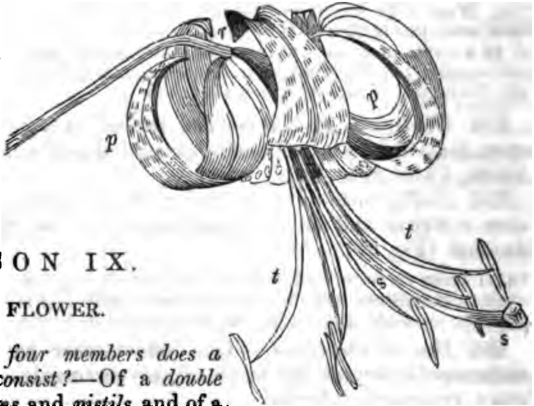


Fig. 106, Tiger Lily.

LESSON IX.

THE FLOWER.

261. *Of what four members does a complete Flower consist?*—Of a *double périanth*, of *stamens* and *pistils*, and of a *receptacle*.

262. *Please point out all these parts in this figure of the Tiger Lily, and in the flower which you hold in your hand.*—The slender, thread-like organs seen at *t t*, are the stamens; in their midst, at *s s*, is the pistil. At *p p*, is the double perianth, consisting of two circular

rows, and each row of three similar leaves; at *r*, is the receptacle.

263. *Are all these members necessary to constitute a perfect flower?*—They are not. A flower is called *perfect* if it has both stamens and pistils, whether it has a perianth or not; because the stamens and pistils only are necessary to the perfection of the seed. The sign or symbol of a perfect flower is this ☿.

264. *Specify the several kinds of imperfect flowers.*—A flower with stamens and no pistils is a *sterile* (♂) flower. A flower with pistils and no stamens is a *fertile* (♀) flower. A flower with neither stamens nor pistils is a *neutral* flower. Examples of ☿ and neutral flowers are seen in the Hydrangea; of ♂ and ♀ in Sagittaria and in the Cucumber family.

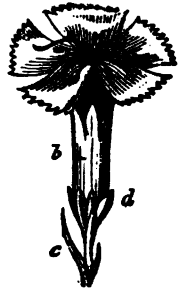


Fig. 107. Pink.

265. *What of the Perianth?*—It is either single or double; that is, it consists of a single circle, or of two or more circles of leaf-like organs, surrounding the stamens. The *outer* circle or whorl is the CALYX, and the inner (if there be more than one) is the COROLLA. A flower, therefore, may have a calyx without a corolla, but it cannot have a corolla without a calyx. If it have neither of them, it is called a *naked* flower.

266. *The Stamens?*—These are those slender, thread-like organs, situated next within the perianth, generally five in number, but varying from one to a hundred or more.

267. *The Pistils?*—These organs occupy the centre of the flower, sometimes numerous, but often only one.

268. *The Receptacle?*—This is merely the summit of the flower-stalk, out of which the floral organs grow, and upon which they stand, the pistils in the centre, the stamens encircling them, the corolla next without and the calyx surrounding the whole.

269. *Point out the parts above-mentioned in this figure of the Pink or in a specimen flower.*—At *a* is the corolla, of five leaves; at *b* is the calyx of five leaves united (except at the top) into a tube, which seems to contain the rest of the flower like a cup; at *d* are certain

leafy appendages called bractlets; at *c* are two *bracts;* within and above the corolla are seen the ten stamens and the two pistils.

270. (Let the learner continue to point out and designate by name the several parts and organs in flowering specimens, until he becomes familiar with the appearance of each, and can instantly apply their names.)

LESSON X.

THE CALYX.

271. *Will you give a more particular description of the Calyx?*—The word is from the Greek language and signifies a cup. In the flower, it is composed of a whorl of leaves called SEPALS, which are either distinct from each other, or grown together by their edges. It is always placed on the outside of the flower, and is generally green, but sometimes *colored* (that is, of some other color than green).

272. *Define the terms monosepalous and polysepalous.*—The calyx is said to be monosepalous when the sepals are united by their edges into a single *piece* (though never a single *sepal*). It is said to be polysepalous when the sepals are wholly distinct.

273. *The free and the adherent calyx are very important distinctions, and require very careful attention. Can you define them?*—The calyx generally stands distinctly *below* the seed-vessel (ovary, § 315), not growing or adhering to its sides: it is then said to be *free*, or *inferior* (Fig. 108,1); as in the Wall-flower and Cherry. But very often it is found adhering to the ovary, so that only the upper part of the sepals rise above it, and seem to

Fig. 108.

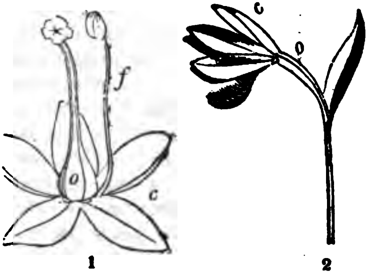


Fig. 108, 1. Calyx (*c*) inferior, ovary (*o*) superior, stamen (*f*) hypogynous.—2, Calyx (*c*) superior, ovary (*o*) inferior.

stand *upon* it: the calyx is then said to be *adherent*, or *superior;* as in the Apple, Currant, Pogonia (Fig. 108, 2).

274. *Give now the reductions of the calyx.*—The calyx is sometimes, apparently, reduced to a mere rim, as in the Caraway, and sometimes (when there is no corolla, § 265) is entirely wanting.

275. *How is it reduced in the Asters, Lettuce, Thistle, and most of the Compositæ?*—It is there reduced to a whorl of mere hairs or bristles and called the *pappus* (See Fig. 115). In these cases it seems that the calyx has not *room* to grow in the usual manner, the flowers being so densely crowded in heads.

LESSON XI.

THE COROLLA.

276. *What description is further given of the corolla?*—COROLLA is a Latin word, signifying a chaplet or crown. It is fitly applied to that whorl of the floral envelops situated between the calyx and stamens, upon whose delicate texture and colors chiefly depends the beauty of the flower.

277. *What are the petals?*—The divisions of the corolla are called PETALS. Like the sepals of the calyx, they are also either distinct, or united by their adjacent edges to a greater or less extent. If quite distinct in this respect, the corolla is *polypetalous;* if united, however slightly, it is said to be *monopetalous.*

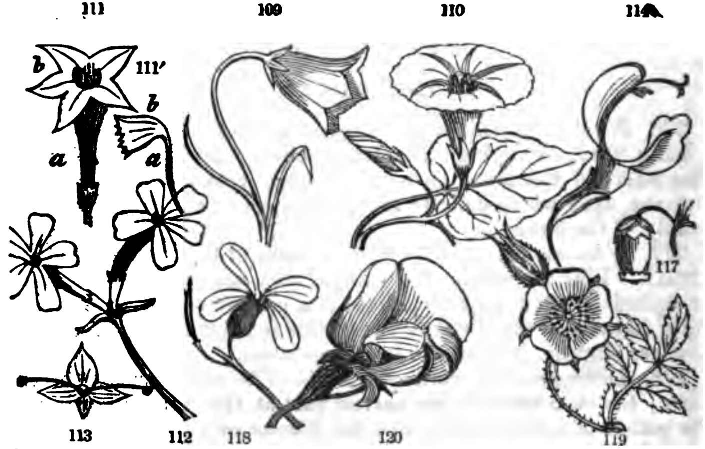
278. *Distinguish the parts of a petal.*—The petal consists of two parts; the *claw* which is the narrow part at the base, answering to the petiole of a leaf (§ 148), and the *lámina* or *border*, which is the expanded portion, supported by the claw, answering to the blade of the leaf. The claw is sometimes very long, as in the Pink, and often entirely wanting, as in the Rose Fig. 111′, *a*, *b*).

279. *The parts of a monopetalous corolla.*—When the petals are united into a monopetalous corolla, the united claws form that part of it which is called the *tube* and the laminas form the upper.

expanded portion of it, called the *limb*. Both these parts are exemplified in the Phlox and Tobacco (Fig. 111, *a*, *b*).

280. ***Distinguish the regular and irregular corolla.***—The corolla is *regular*, when its corresponding parts are all alike in form, size, cohesion, &c., and *irregular* when they are not. We quickly perceive that the Rose, Tulip, Mustard have regular flowers, and the Bean, Pea and Lark-spur, irregular.

281. ***The monopetalous corollas assume many forms which have received appropriate names. Will you describe in order, first, the Campanulate?***—This is a bell-shaped corolla, having the tube wide above, contracted abruptly at base, as in the Bell-flower and Greek Valerian (Fig. 109).



FORMS OF COROLLAS.—109, Bell-wort; 110, Morning-glory; 111, Tobacco; 112, Phlox; 113, Speedwell; 114, Sage Clarry; 117, Winter-green (urceolate or urn-shaped); 118, Cabbage; 119, Rose; 120, Pea.

282. ***Infundibuliform?***—Funnel-form; tubular at base, gradually enlarging toward the border; as, Morning-glory, Tobacco, Ipomæa (Fig. 110).

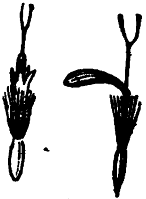
283. *Hypocratériform?*—Salver-form; the tube ending abruptly in a flat, spreading border; as, the Phlox (Figs. 111, 112).

284. *Rotate?*—Wheel-form; limb regular or nearly so, spreading, with a very short, or hardly perceptible tube; as in Mullein, Speedwell. (Fig. 113.)

285. *Labiate?*—Lipped; the limb deeply divided into two irregular segments, called the *upper* and *lower lip*. If the lips be widely separated, the corolla is *ringent* (grinning); as, the Monkey-flower: if closed, it is *personate* (masked); as, the Snap-dragon. The upper lip is also often *arched* as in the Henbit.

286. *Tubular?*—Where the corolla is a tube only, scarcely expanding at top into a limb; as, Trumpet Honey-suckle, and the disk flowers of the Compósitæ (Fig. 115).

287. *Ligulate?*—Strap-shaped; a corolla tubular at base, with a long, narrow limb, all turned to one side, generally with five points at the end showing the union of the petals. Such are the ray-flowers of the Sunflower, Goldenrod (Fig. 116), and of most of the Compósitæ.


115 116
Florets of Solidago.

288. *Several forms of polypetalous corollas have also received appropriate names, and you may describe them as follows. First, the Cruciform.*—Crossing, or cross-shaped; consisting of four petals spreading at right-angles to each other. Plants with this corolla constitute the large family of the Cruciferæ, including the Mustard, Rocket, Wall-flower (Fig. 118).

289. *Rosàceous.*—Like the Rose. A regular corolla, consisting of five or more petals spreading horizontally, attached to the receptacle by very short claws; as, the Rose, Apple, Strawberry, and a thousand other plants (Fig. 119).

290. *Liliàceous.*—Like the Lily; this is a regular perianth, consisting of six parts usually in two whorls, each gradually bending outward in such a manner as to resemble the campanulate form; as, the Lily, Tulip (Fig. 105).

291. *Caryophyllàceous.*—Like the Pink; this corolla is also reg-

ular, consisting of five petals having long claws included in the tubular calyx; as, the Pink, Cockle (Lychnis) (Fig. 106).

292. *Papilionàceous.*—Butterfly-shaped; an irregular corolla, consisting of five dissimilar petals which are named as follows. The upper and largest is called the *banner*, the lateral ones beneath this the *wings*, and the two lower, cohering by their lower margins, the *keel*. Plants with this kind of corolla constitute the greater part of the Leguminosæ, one of the largest and most useful of the Natural Orders, (Fig. 120.)

LESSON XII.

OF THE NECTARY AND DISK.

293. *What is said of these terms in general?*—These terms have been applied to certain unusual forms of the floral organs, which are very variable in their form and position.

294. *What is the Nectary?*—The *Nectary* is properly an apparatus for forming and containing honey (or *nectar* in Latin).

295. *Give us some examples and forms of the nectary.*—In the Violet, Larkspur, Columbine, &c., it consists of a lengthening of a petal into a *spur*. In the Indian Cress it is a similar lengthening of a sepal. In the Passion-flower, Gold-thread, Grass of Parnassus, the (so-called) nectaries are merely abortive stamens, changing into petals.

296. *What is said of the so-called nectary of the Ladies' Slipper or Cypripedium, and of other plants of the Orchidàceæ?*—The lower petal being larger and inflated into the form of a sack or pouch, was called a nectary by Linnæus, but is now generally called the *lip*.

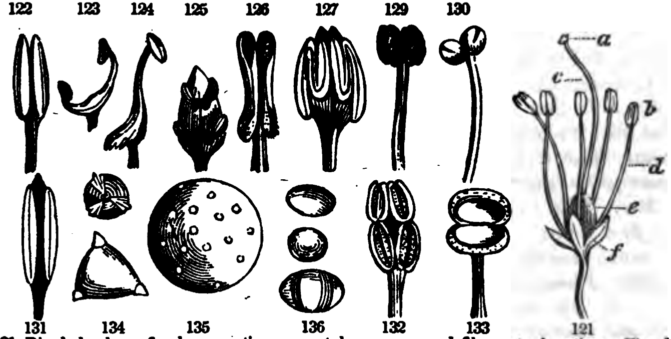
297. *Have you any knowledge of the Disk?*—But little; it is not found in every flower. It is usually situated between the pistils and stamens, and in the form of a rim surrounding the base of the ovary, as in the Pæony; or it appears at the top of the ovary when the calyx is adherent, as in the Corneil.

LESSON XIII.

OF THE STAMENS.

298. *How are we to distinguish the stamens?*—They are the organs situated next within the corolla surrounding the pistils, in the midst of the flower, and usually of a slender, thread-like form.

299. *What are the parts?*—The *filament*, *d* (Fig. 121), the *anther*, *b*, containing the *pollen* in its cells. The filament is sometimes wanting, and then the anther is *sessile*.



121, Rhododendron, *f*, calyx; *a*, stigma; *c*, style; *e*, ovary; *d*, filament; *b*, anther. Figs. 122—133, forms of the stamen in different species.—134, 135, &c., grains of Pollen magnified.

300. *The Filament?*—It comes from the Latin word *filum*, a thread, and denotes the slender stem which supports the anther at or near its top. It is analogous to the petiole of a leaf, or the claw of a petal. When it is wanting the anther is *sessile*.

301. *The Anther?*—It is commonly placed at the top of the filament, and attached to it in various ways. It is composed of two lobes or cells which generally open lengthwise by lateral fissures, but sometimes by terminal pores; as in the Potato and Blueberry.

302. *The Pollen?*—This is, in appearance, little yellow grains contained in the cells of the anther. When seen through a microscope

the grains appear of some regular figure, as globular, or oblong, or angular, &c. (Figs. 134, 135, 136, &c.)

303. *What is the office of the Stamens?*—The office and use of the stamens is to *quicken* the young seeds (ovules, § 324), by conveying the pollen to the stigma—without which there can be no fruit matured.

§ 1. THE LINNÆAN CLASSES.

304. *In what respects do the stamens vary in different species of plants?*—In their number, position, relative length, connection and presence; and upon these five different conditions of the stamens the twenty-four Linnæan Classes are founded.

305. *Who was Linnæus?*—The most eminent of naturalists, native of Sweden, from 1707 to 1778, the inventor of that system of classification in botany which bears his name.

306. *Is this system of classification still in use?*—Not generally. But still we ought to acquaint ourselves with the definitions of the twenty-four classes on account of the use made of their names in descriptive botany.

307. *Well, then, will you state upon what condition of the stamens the first eleven classes are founded?*—Upon their *number*, they being of equal length and disconnected with each other.

308. *Please define these eleven classes in order.*—

1. *Monándria.*—One stamen. Includes all plants which have but one stamen to the flower.
2. *Diándria.*—Plants with two stamens to each flower.
3. *Triándria.*—Plants with three stamens to each flower.
4. *Tetrándria.*—Plants with four stamens to each flower.
5. *Pentándria.*—Plants with five stamens to each flower.
6. *Hexándria.*—Plants with six stamens to each flower.
7. *Heptándria.*—Plants with seven stamens to each flower.
8. *Octándria.*—Plants with eight stamens to each flower.
9. *Enneándria.*—Plants with nine stamens to each flower.
10. *Decándria.*—Plants with ten stamens to each flower.
11. *Dodecándria.*—Plants with eleven to nineteen stamens, &c.

309. *The second condition with its two classes?*—The next two

classes are founded upon the *position* of the stamens, their number being twenty or more, and their filaments distinct; namely,

12. *Icosándria*, stamens indefinite in number, situated on the calyx (that is, *perígynous*).

13. *Polyándria*, stamens indefinite in number, situated on the receptacle (that is, *hypógynous*; Fig. 107).

310. *The third condition with its classes?*—The next two classes are founded upon the *relative length* of their stamens, together with their number; namely,

14. *Didynàmia*, with four stamens, two longer than the other two.

15. *Tetradynàmia*, with six stamens, four longer than the other two;

311. *The fourth condition with its classes?*—The next five classes depend upon the *connection* of the stamens in various ways;

16. *Monadélphia*, the filaments united into one set.

17. *Diadélphia*, the filaments united into two sets.

18. *Polyadélphia*, the filaments united into several sets.

19. *Syngenèsia*, the anthers united into a tube: flowers in heads, and

20. *Gynándria*, stamens consolidated with the pistil.

312. *The fifth condition with its classes?*—The four remaining classes depend upon the *absence* of the stamens in a part or all of the flowers of the same species; they are

21. *Monœcia*, stamens and pistils in separate flowers on the same individual plant (symbol, ⚥).

22. *Diœcia*, stamens and pistils in separate flowers on different individuals of the same species (symbol, ♂ ♀).

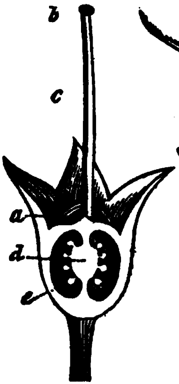
23. *Polygàmia*, flowers perfect, sterile and fertile, either on the same, or on different plants of the same species (symbol, ♂ ☿ ♀).

24. *Cryptogàmia*, stamens and pistils wanting. Plants flowerless.

LESSON XIV.

OF THE PISTILS.

313. *What is the position of the Pistil?*—The pistil or pistils occupies the centre of the flower at the extremity of the axis.



137, Whortleberry.

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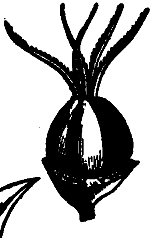

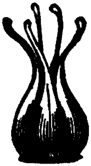

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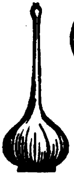

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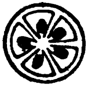

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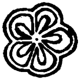

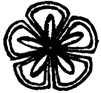

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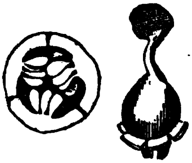
314. *What are its parts?*—It consists of three parts, the *ovary*, *e* (Figs. 137, 145), the style, *c*, and the stigma, *b*. The style is sometimes wanting, and the stigma then is said to be *sessile* upon the ovary.

315. *Describe the Ovary.*—It comes from the Latin word *ovarium*, a depository of eggs. It is the tumid and hollow part of the pistil, situated at its base, containing the *ovules*, or young seeds, within its cavities, and destined to become the fruit.

316. *I wish you now, if you are able, to describe the Carpels.*—The ovary is either *simple* or *compound*. When compound it consists of two or more lobes or divisions, called CARPELS (from the Greek word, *karpos*, fruit), united together more or less closely.



144 145
The Pistil of a Violet, and a cross section of the Ovary.

317. *It is often very important to distinguish the number of the carpels; but how can it be done?*—We can generally perceive the carpels by the outward lobes of the ovary; or they may often be known by the number of the stigma lobes, where the styles are united (See the 5-lobed stigma, *s*, Fig. 107).

318. *Please show by the figures* (138, 139, 140, 141, 142, 143) *how the carpels are united in different degrees.*

319. *Define the Style.*—The style is that prolonged, columnar part of the ovary, or rather of each carpel, which bears the stigma at the top. The number of styles (where there are *any*) is always equal to the number of carpels.

320. *How can this be, since the compound ovary has often, apparently, but one style?*—Sometimes, when the carpels are united into one ovary, the styles are also united in one compound column; or they may even then be distinct.

321. *Illustrate this by the figures, or by specimens* (Figs. 137—145).

322. *Now let me hear you describe the Stigma.*—This is the upper portion or extremity of the style, extremely variable in form, but generally disk-like or globular. Like the ovary and style, it is either simple or compound. When it is compound, it consists of as many lobes as there are carpels.

§ 1. OF THE LINNÆAN ORDERS.

323. *What use did Linnæus make of the Number of the styles?*—He made it the basis of the artificial orders of his first thirteen classes, as follows:—

1. *Monogýnia*, with one style to each flower—simple or compound.
2. *Digýnia*, with two styles. 3. *Trigýnia*, with three styles.
4. *Tetragýnia*, with four styles. 5. *Pentegýnia*, with five styles.
6. *Hexagýnia*, with six styles. 7. *Heptagýnia*, with seven styles.
8. *Octogýnia*, with eight styles. 9. *Enneagýnia*, with nine styles.
10. *Decagýnia*, with ten styles. 11. *Dodecagýnia*, with twelve styles.
12. *Polygýnia*, with many styles.

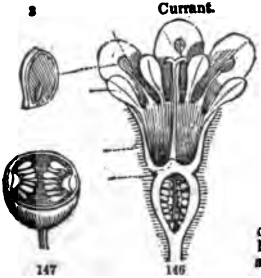
§ 2. OF THE OVARY AND OVULES.

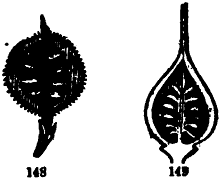
324. *What are the Ovules?*—These are certain little globular

bodies produced in the cells of the ovary, destined to become the seeds.

325. *Explain the figures*, 137, 146.

326. *What is the Placénta?*—It is that part of the ovary from which the ovules arise, or grow, and to which they are attached. It consists of a line or fleshy ridge, placed in some corner of the cell, always parallel with the axis of the flower, that is, extending *up and down.*





146, Perpendicular section of the flower of the Garden Currant, showing every part. 148, Perpendicular section of the fruit; 147, a cross-section of the same. (3, Section of a seed, showing the embryo.)

327. *The positions of the Placéntæ?*—The placentæ are *parìetal* when they grow upon the sides or wall of the ovary, as in the Currant (146, 147, 148)—*central* when growing in the axis, and *free central* when in the centre or axis without having any connection with the sides; as in the Pink and Primrose (149).

328. *The free and adherent ovary are very important distinctions. Can you distinguish them?*—The ovary is said to be *adherent* or *inferior*, when its sides grow to the calyx, so that the sepals seem to stand upon the ovary; but when the ovary does not adhere to the calyx, it is said to be *free* or *superior* (§ 273, Figs. 107, 108, *o*).

329. *Illustrate these things by explaining the figures.*

330. *Illustrate them by examples.*—In this Larkspur, or Violet, or Cherry blossom, the ovary is seen *within* the calyx *above* its base, and therefore is *free*, or superior to the calyx, which is *inferior*. In the Snow-berry, the Apple, and the Elder, the ovary appears *below* the calyx in consequence of growing to it within, and is therefore *adherent*, or *inferior*, while the calyx is *superior*.

331. *What is meant by half free or half superior?*—Having only the *lower half* of the ovary adhering to the calyx, as in the False Syrínga (Philadélphus).

332. *What is the office and use of the Pistil?*—It protects and nourishes the young seeds or ovules. The stigma catches some of the pollen as it falls from the anthers, and conveys through its soft, porous substance, the quickening matter to the ovules contained in the cells of the ovary.

LESSON XV.

ARRANGEMENT OR PLAN OF THE FLOWER.

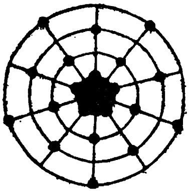


Fig. 150.

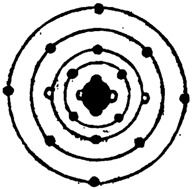


Fig. 151

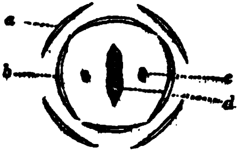


Fig. 152.

PLANS OF FLOWERS.—150, of Sedum ternatum and other regular and symmetrical flowers. The outer circle shows the place of the 5 sepals; the next circle, the 5 petals; the next, the 5 stamens; then the 5 pistils.—151, plan of a cruciform flower, as of the Mustard, with 4 sepals, 4 petals, 2 stamens (and 2 wanting) in the third circle, 4 stamens in the fourth circle, 2 carpels (2 wanting) in the fifth circle.—152, plan of the flower of Speedwell. *a*, the 4 sepals; *b*, the 4 petals (unequal); *c*, the 2 stamens; *d*, the 2 carpels.—*Is it symmetrical, or not?*

333. *If you have attentively examined the structure of many flowers, you have probably noticed that there is a manifest tendency in them all towards one general plan of arrangement, &c., however diversified in size, color, number, and form they may be. Can you state some instances of these tendencies?*

1st, A tendency to consist of four different sets of organs, in four or five whorls.

2nd, To contain the same number of distinct and equal organs in each whorl.

3rd, To have the organs of each whorl stand alternate with those of the adjacent whorls.

334. *Are there many flowers which conform to this plan in all respects?*—There are but few, since in almost every plant the flowers deviate from it in some way peculiar to itself.

335. *Can you mention any examples at all of such a flower?*—Yes; all the species of the Houseleek family are of this sort; thus, the flowers of Sedum ternatum and Sèdum ácre (153) have each five whorls of organs, with five or four in each whorl. Sempervivum tectorum (154) has four whorls, each with 10 or 12 organs. Tillæa has four whorls, with 3 organs in each whorl. These flowers are both *regular* and *symmetrical.*

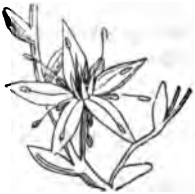


Fig. 153.

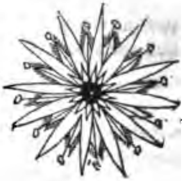


Fig. 154.

336. *What do you understand by a symmetrical flower?*—It is one in which there is the same number of organs in each of the whorls. Thus the Trillium has 3 sepals, 3 petals, 6 stamens in 2 whorls of 3 in each, and 3 carpels.

337. *A regular flower?*—It is one in which all the organs of the same whorl correspond with each other in form, size and connection; as, the Tulip, Rose (single), Columbine, Mallows.

338. *An irregular flower?*—One in which the parts of the same whorl are not alike. In the Violet, the petals are dissimilar. In the Bean family, the petals and stamens differ. In the Labiatæ, also, the petals, stamens and sepals are, respectively, dissimilar.

339. *Give examples of unsymmetrical flowers.*—The flowers of the Mustard and all other cruciferous plants are unsymmetrical, having 4 sepals, 4 petals, with 6 stamens and 2 carpels. The Poppy family, also, has flowers with 2 sepals, 4 petals, and an indefinite number of stamens and carpels.

340. *Are all irregular flowers unsymmetrical also?*—They are not. For example, nothing can be more irregular than the Ladies'-slipper; yet we can find in it 3 sepals, 3 petals, 3 stamens, and 3 car-

pels, although some of these organs are much disguised. There are many such examples.

341. *Will you examine the flower of the Monk's-hood, and tell me how many sepals, how many petals, &c., it has?—also, the Snake-head? and the Beard-tongue? and the Fleur-de-luce (and many others)?*

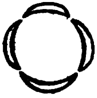
342. *Will you tell me now about double flowers—what are they?*—We call a flower *double* when the petals become twice or several times as many as usual, as in the Rose and Pæony. This effect is almost always owing to cultivation.

343. *Can you explain this subject a little farther?*—It is too great a subject to be fully explained in this book; but one thing I have noticed: that when, in the Rose, &c., the petals *increase* in number, the *stamens diminish*. I suppose, therefore, that the stamens are transformed to petals. (See this subject more fully illustrated in the Class-Book of Botany, pp. 30–33.)

LESSON XVI.

OF ÆSTIVATION.

344. *I suppose this is a word which you have not often met with. Can you recite its meaning?*—It is formed from the Latin word *æstivus*, the summer, and is used by botanists to denote the manner in which the several leaves of the flower are folded up in the bud.



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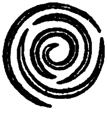

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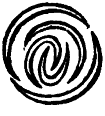

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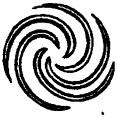


158

345. *How can we best observe the æstivation of a flower bud?*—By a cross-section, that is, by cutting the bud square across in its midst, with a keen knife. In this way we see many varieties of arrangement; of which only a few are here described. (See Class-Book of Botany, pp. 50 & 83.)

346. *What is the Valvate Æstivation, and an example?*—It is

where the petals or sepals, &c., meet each other by their edges only; as, the petals of Umbelworts, or the Lilac, or the valves of a capsule (155).

347. *The Cónvolute?*—The rolled æstivation; when one is wholly rolled up in another; as, the petals of the Wall-flower (156) (157, rose-bud).

348. *The Contórted?*—The twisted æstivation; when each piece overlaps its neighbor in the same direction, that is, all towards the right or the left. Such buds appear twisted; as, the Phlox, Oleander, Dog's-bane (158).

349. *The Im'bricated?*—The shingled; a general term, denoting that the pieces overlay each other, edge upon edge, in either of the above-mentioned ways, like shingles on a roof.

350. *Does the term Æstivation apply to the leaf-bud as well as the flower-bud?*—It does not. *Vernàtion* is the word which applies to the leaf-bud.

351. *Define this word.*—It is formed from the Latin word *vernus*, the spring, and denotes the folding of the young leaves in the leaf-bud.

352. *Define the E'quitant vernation.*—It is where the leaves overlay each other without being rolled; as in the Iris.

353. *The Plaited and the Círcinate?*—Plaited, when the leaf is folded like a fan, as in the Birch, Palm; and *círcinate* when rolled downward from the apex, as in the Sundew, Fern.

LESSON XVII.

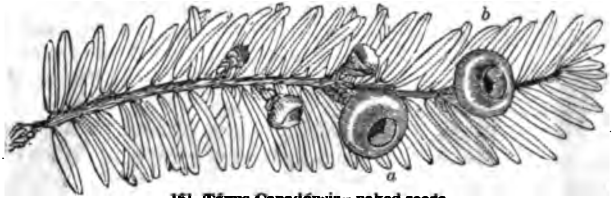
THE FRUIT.

354. *Repeat the definition here given.*—The *fruit* is the matured pistil, or, the ovary brought to perfection.

355. *What is said of its value and importance?*—It is regarded as the most important part of the plant, not only serving to perpetuate vegetable life, but affording one of the principal means of sustenance to animals and to man.

356. *What of its colors?*—Although, in general, its beauty is far inferior to that of the flowers, yet sometimes its color is more brilliant than that of the blossom which produced it.

357. *Of what does the fruit consist?*—Of the *pericarp* and the *seed.* Sometimes of the *seed* only, there being no pericarp.



161, Taxus Canadensis—naked seeds.

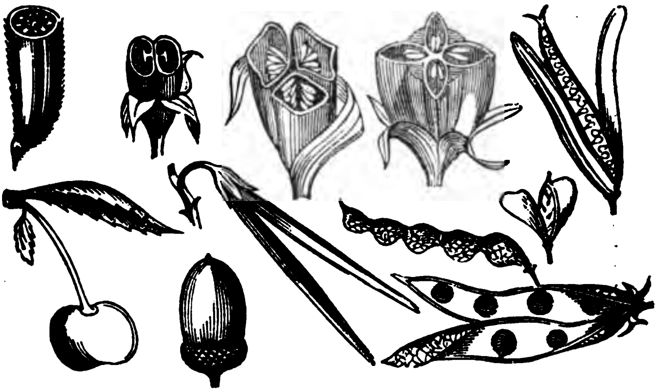
358. *What can you say concerning naked seeds?*—Certain kinds of fruit resemble naked seeds; as, the Butter-cups, Sage, Maize and Wheat. But the presence of the *pistil* or the *stigma* in these flowers proves that there was also an *ovary*, and consequently a *pericarp.* But in the Fir family, as Pines, Spruces, Cedars, &c., there is no pistil or stigma in the flowers, and the seeds are truly naked (Fig. 161, *a*, *b*).

359. *What is the Pericarp?*—It is the covering or envelope of the seeds, of whatever nature it may be. It generally consists of three coats, whose peculiarities may be readily seen in the Peach, Apple, and Cherry, but are very obscure in many fruits. First is the cuticle or *epidermis* outside; 2d, the *flesh-coat*, or pulp; and 3d, the *shell-coat*, within, next the seed. (For a more particular description of these coats, and also concerning the ripening of fruits, see Class-Book of Botany, p. 52.)

360. *What constitutes the eatable part of fruits?*—This is extremely various. In the Apple, Quince, &c., it is the calyx cohering with the ovary, which becomes the fleshy, eatable part. In the Strawberry, it is the receptacle. In the Checker-berry, the calyx becomes fleshy and eatable without adhering to the ovary. In most plants, however, the nutritious matter is laid up in the seeds, while the carpel ripens into a *dry* fruit.

§ 1. FORMS OF THE FRUIT.

361. *These are very numerous, but the following, only, are of much service in the distinction of orders and genera. Please define a Fŏllicle.*—This is a dry fruit or pod formed of a single carpel, and opening when ripe by a single seam, which is on the front side and called the *ventral suture.* Ex. Columbine, Larkspur, Silk-grass.



Forms of Fruit.

362. *A Legume.*—This is also a sort of pod, consisting of a single carpel, opening by two valves and two seams, but having the seeds attached to the ventral suture only. The Pea, and all other plants of the great order Leguminosæ, are examples. (Figs. 168, 169.)

363. *A Silique.*—A sort of pod, formed of two carpels, with two cells, and opening by two valves. The seeds are attached alternately to the two edges of the thin membrane which separates the two cells. The fruit of the Mustard family (Crucifers) are either siliques or *silicles* Fig. 166.)

364. *A Sílicle—how does it differ from a Silique?*—Only in form. The Silique is long and narrow, as in the Mustard; but the Silicle

is short and oval or ovate in form, as in the Shepherd's-purse, Pepper-grass. (Fig. 167.)

365. *How do you explain the Membrane which separates the cells in these fruits?*—Since the seeds are attached to its two edges, I suppose that it consists, in fact, of *the two placentæ*, which here separate from the valves.

366. *The Capsule?*—This word signifies a casket, and is applied to those compound fruits which are dry and woody in texture, consisting of several united carpels.

367. *What is said concerning the opening of Capsules?*—While there are many kinds of fruits which never open (as the Apple), the capsule opens, when ripe, at the sides or the top, by valves or by pores.

368. *Will you mention the botanical terms used in these cases?*—The opening of the fruit is called its *dehiscence.* If it do not open at all, it is called *indehiscent.*

369. *Mention some of the varieties of the Capsule.*—The capsule, although it is a compound fruit, often contains but a single cell (§ 320), as in the Pinks and Primroses; or it is divided within, by partitions, into several cells (Fig. 162, one-celled; 163, two-celled; 164, three-celled; 165, four-celled).

370. *What name is given by botanists to these partitions?*—DISSÉPIMENTS.

371. *What of the number of the cells?*—A two-carpeled capsule may have two cells, as in the Mullein, Speedwell: a three-carpeled capsule may have three cells, as in the Lily, Iris, Orchis: a four-carpeled capsule four cells, as in Evening-primrose: a five-carpeled, five cells, as in Rhododendron, &c. Rarely there are twice as many cells as carpels, as in the Flax. (Figs. 162, 163, 164, 165.)

372. *Describe the Drupe.*—It is a stone fruit, (like the Cherry, Peach,) indehiscent, one-carpeled, (rarely two-carpeled,) having a hard shell-coat within and a soft flesh-coat without (Fig. 172).

373. *Where do you class such fruits as the Butternut and Walnut?*—Among drupes; or rather, they are called *drupàceous* fruits, having the two outer coats not fleshy, but woody or leathery.

374. *What is a Nut?*—It is a dry, hard, indehiscent shell, hav-

ing but one cell and one seed (with the rudiment of another). It has no soft and fleshy coat like the drupe, but is seated in a kind of involucre, called a *cupule;* as, the Chestnut, Beechnut, Acorn, Hazelnut. (170.)

375. *How do you account for its rudiment of a second seed?*—The ovary from which the nut is produced, has two cells and two ovules, but one of the cells with its ovule is suppressed, that is, never grows, while the other enlarges and occupies the whole shell of the fruit.

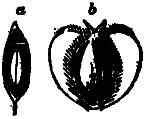
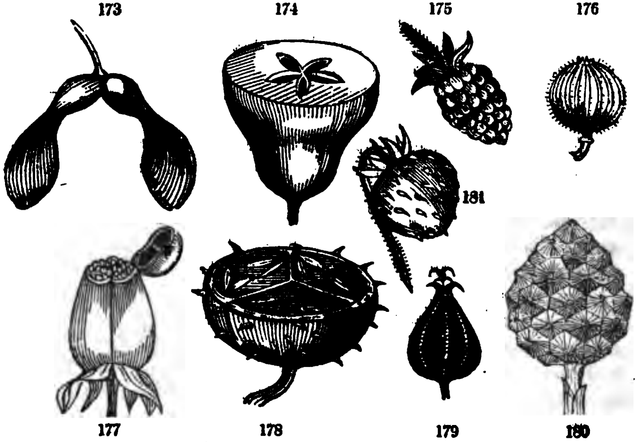


Fig. 172, a winged nut of the Birch.—*a*, cross section; *b* perpendicular section, giving different views of the rudiment. *Explain it.*

Fig. 172.

376. *Describe a Caryópsis.*—It is a kernel—a small, dry, seed-like, one-celled, simple fruit, inseparable from the seed which it encloses, as in Maize, Wheat, Carex, and most of the grasses.

377. *An Achénium.*—A small, dry, seed-like, one-celled, indehiscent fruit, not inseparable from the seed which it encloses, as in the Crow-foot, Borrage, Aster, and the Compositæ generally.



Forms of Fruit.

378. *A Utricle.*—Differs but little from an achenium, being a little membranous fruit more or less inflated, with a single seed; as in the Pigweed.

379. *A Samàra.*—A winged fruit—dry and one-seeded, lengthened at the apex into a wing-like appendage, as in the Maple, where they are double, or in the Ash, where they are single. (173.)

380. *A Pyxis.*—A capsule opening across by a lid, as in the Purslane, Plantain, Henbane (177).

381. *A Pome.*—A fleshy, indehiscent pericarp (like the Apple), formed of the permanent, adherent calyx, and containing several cartilaginous cells. (174.)

382. *A Pepo.*—A fleshy, indehiscent pericarp like the Pumpkin, Cucumber, Gourd and Squash. (178.)

383. *A Berry.*—This is a soft and fleshy fruit, always indehiscent, enclosing many seeds in its pulp; as, the Currant, Grape. (176.)

384. *What say you of the Strawberry?*—It is not a berry, but a fleshy receptacle, bearing the achenia (which resemble seeds) on the outside (181).

385. *What of the Blackberry, Raspberry, &c.?*—These fruits are compounded of many achenia, each enclosed in a coat of pulp (175).

386. *Describe a Stróbile.*—This is the hard, scaly fruit of the Pine, and other Coniferæ (180).

LESSON XVIII.

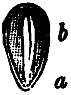
OF THE SEED.

387. *How will you characterize the Seed?*—The seed is the full-grown ovule, the last product of vegetation, containing the embryo of a new plant which is similar in all respects to the original plant.

388. *What are the parts of the Seed?*—The EMBRYO, the TESTA (or skin), and (sometimes) the ALBÚMEN.

389. *Describe the Embryo.*—The EMBRYO is an organized, or living body, the rudiments of the young plant, situated within the

coverings of the seed. To promote the growth of this, all the other parts not only of the seed, but of the fruit and flower seem designed. In some seeds the embryo is plainly seen; as in the Bean, Pea, Morning-glory. In other seeds it is very small.



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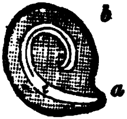

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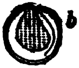


183

390. *Describe the parts of the Embryo.*—They are seen in this figure (181*, &c.) as follows:—the *radicle* (*a*), or young root; the *plúmule* (*b*), the ascending part, or young stem with the *cotýledons*, the young leaves, bulky and porous, generally stored with nutriment for the whole.

391. *Does the Embryo occupy the whole space within the coats of the seed?*—In many plants it does, as in the seeds of the Apple, Rose and all the Roseworts, and also of the Leguminous plants. But more commonly a part of the space is occupied by albumen.

392. *What is the Albûmen?*—The Albumen of the seed is a collection of starch and other similar matter, designed for the nourishment of the embryo while in the first stages of its growth. Seeds are therefore said to be *albuminous* and *exalbuminous.*

393. *In Albuminous seeds, how is the embryo situated?*—It is generally found lying in the midst of the albumen, surrounded by it. But often it is found outside the albumen, either coiled around it, as in the Poke plant, Purslane, or lying at the end of it as in the Grasses. (Figs. 181,* 182, 183, and 186.)

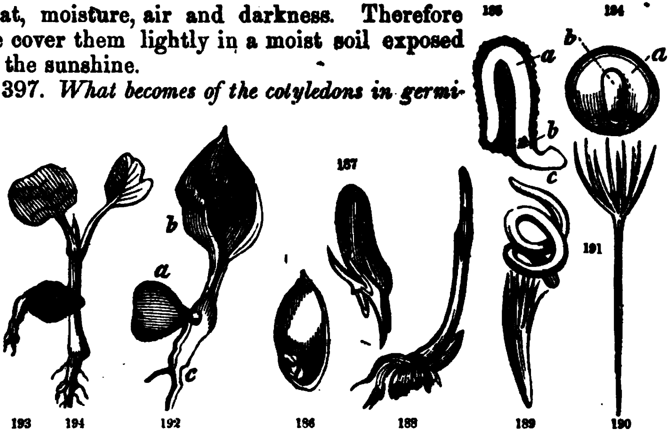
394. *What is said of the number of the Cotýledons?*—The number of the cotyledons of the embryo is variable. In the Crowfoots, Crucifers, and all the Exogens (§ 111, 112), there are two cotyledons. In the Lilyworts, Orchids, and Endogens generally, there is but one cotyledon. In the Conifers there are several, and in the Cuscuta there is none at all.

395. *What is signified by the term Germinàtion?*—The word denotes the earliest growth of the embryo in the seed, or the first stages of vegetation in a plant.

396. *What are the requisite conditions of Germination?*—In order that seeds may germinate, they should have a certain amount of

heat, moisture, air and darkness. Therefore we cover them lightly in a moist soil exposed to the sunshine.

397. *What becomes of the cotyledons in germination?*—They generally rise above the surface, in the Exogens, and expand into the two first and lowest leaves, as seen in the Bean, Beech-nut, Maple. But in the Endogens, the single cotyledon remains below the surface.



398. *What is said of the fruit of the Cryptogàmia?*—The Flowerless Plants, as the Ferns and Mosses, produce *spores* instead of seeds. These have no appearance of an embryo, but appear similar to the pollen grains (§ 302) of other plants.

(*Explain the figures.*—Fig 184, seed of Canna (Indian Shot): *a*, albumen; *b*, embryo with one cotyledon. 185, Water-Plantain: *a*, its one cotyledon; *b*, plumule; *c*, rootlet. 186, Grass seed, cut through, showing the embryo at one end. 187, The same beginning to sprout. 188, The same having grown to a young plant. 189, Pine seed with its many cotyledons. 190, The same having become a little plant. 191, Embryo of the Dodder seed. 192, Seed of the Calla becoming a young plant. 193, Fruit of the Four-o-clock germinating. 194, The same having thrown off the pericarp and become a plant.)

LESSON XIX.

SYSTEMATIC BOTANY.

399. *What is the subject of this Lesson?*—We are now about to examine some of the best methods of classifying or arranging plants, so that we may be able to study them as constituting one grand System.

400. *What are some of the benefits of Systematic Botany?*—When we examine a plant in relation to the great System of which it is a part, we see much more that is interesting and admirable in its organization, than when we study it alone.

401. *Illustrate your meaning.*—Suppose that I should pick up in the way the balance-wheel of a watch. I might think it curious, and neatly made; but I should have no idea of its value, or of the skill of its contrivance, until I had found out *its relation to the other wheels* and parts of the watch;—in other words, until I understood how it worked with the other wheels.

402. *How do these studies affect us in view of the Great Creator?*—We here discover a new and vast design in the Vegetable Kingdom, leading us to adore and love that great and good Being who planned and created the world. For we see that He has not only made each plant with so much loveliness and perfection in itself, but has also assigned to each species its own proper rank in the System, and endowed it with just that nature, habit, and style of beauty which adapt it to its rank.

403. *You have already learned how to define a Species and a Genus* (§ 24–28); *but as these divisions are very important, will you now repeat, first, the definition of a Species?*—(§ 24.)

404. *Also the definition of a Genus?*—(§ 27.)

405. *Is there more than one method of Classification?*—Yes, many.

406. *In what respect do they all agree?*—They all agree in having the same genera and species, but differ very much in their methods of arranging or grouping the genera.

407. *What two methods are the most important to us?*—The Natural and the Artificial—the one according to *nature*, the other invented by *art*.

408. *Can you give an illustration of an artificial arrangement?*—Suppose you were arranging the books of a large library in good order upon the shelves. If you should place all those of the folio size upon the lower shelves, of the quarto size upon the second shelves, of the octavo size next, the duodecimo and the 18mo on the upper shelves, you would have an artificial arrangement, because you had respect to the single quality of *size* only.

409. *Of a natural arrangement?*—But suppose you should arrange your books according to the subjects of which they treat, placing the poetical works in one department, the works of fiction in another, of history in another, of mathematics in another, and of natural science in another;—this would be a natural arrangement, because founded upon the real nature of the works.

§. OF THE ARTIFICIAL SYSTEM.

410. *Give an account of the Artificial System of classification.*—In this System plants are arranged according to the stamens and pistils only, leaving all other characters out of view. It was invented by Linnæus, one of the earliest and best of botanists, and is sometimes called the Linnæan Arrangement.

411. (Here, if necessary, let the pupil review the definitions of the Artificial Classes, § 313–318, also the Artificial Orders, § 329.)

412. The following table will aid the learner in understanding the true characters which distinguish the 24 Linnæan Classes, and also enable him to determine readily to which Class any plant may belong. The use of the table is so manifest, that no explanation more than the teacher can give may be necessary; still, the directions immediately following it may be found useful to some.

A VIEW OF THE LINNÆAN SYSTEM.

Class.
1 Plants never having stamens or pistils (*belong to*)........Cryptogàmia, 24
1 Plants having stamens and pistils (*Pass on to the lines numbered*)....2
2 Stamens and pistils in the same flower (*Pass to numbers*)....4.
2 Stamens and pistils in separate flowers....3.
3 Some of the flowers ♂, some ♀, some ☿, on 1, 2, or 3 different individual plants.................................Polygàmia, 23
3 Staminate flowers on some plants, and pistillate on others .....Diœ̀cia, 22
3 Staminate and pistillate flowers on the same individual plant, Monœ̀cia, 21
4 Stamens adhering to the pistils in one column..........Gynándria, 20
4 Stamens free (§ 328) from the pistils....5
5 Stamens connected with each other by their anthers......Syngenèsia, 19
5 Stamens connected with each other by their filaments....6
5 Stamens not connected with each other....7
6 Filaments united in more than two sets.............Polyadélphia, 18
6 Filaments united in two sets ....Diadélphia, 17
6 Filaments united in one set ....Monadélphia, 16
7 Stamens of unequal length (either 4 or 6).....8
7 Stamens of equal length (from 1 to 100 or more)....9
8 Stamens 6, two of them shorter than the other 4.....Tetradynàmia, 15
8 Stamens 4, 2 of them shorter than the other 2 ....Didynàmia, 14
9 Stamens indefinite (too many to be readily counted, and variable)....1
9 Stamens definite in number....11
10 Stamens not adhering to the calyx.....................Polyándria, 13
10 Stamens adhering to the calyx.........................Icosándria, 12
11 Stamens twelve in number.....................Dodecándria, 11
11 Stamens ten ....Decándria, 10
11 Stamens nine ....Enneándria, 9
11 Stamens eight ....Octándria, 8
11 Stamens seven................................Heptándria, 7
11 Stamens six..................................Hexándria, 6
11 Stamens five ....Pentándria, 5

11 Stamens four.................................. Tetrándria, 4
11 Stamens three.................................. Triándria, 3
11 Stamens two.................................. Diándria, 2
11 Stamens one.................................. Monándria, 1

Directions in using this and other similar Tables.

To find by this table the class of any plant which you may have in hand, commence with the first lines and decide which of them applies to your plant. If it "have stamens and pistils," pass on to the lines numbered 2, and see which of them applies. If your specimen "have stamens and pistils in the same flower," pass to numbers 4, and decide. If now your plant have "stamens adhering to the pistils," it belongs to Gynandria: if not, pass on to 5s, and if the third line there applies, pass to 7s. If only the second of these lines applies, pass to 9s. Now if you find the stamens in your plant to be "definite," pass to the numbers 11. Are there 5 stamens? then your plant belongs to Pentandria.

LESSON XX.

OF THE NATURAL SYSTEM.

413. *What is the object and aim of the Natural System?*—It is to classify and arrange the Genera of plants, as nearly as possible, in the order of nature, so that those only shall be grouped together which most resemble each other in *all respects.*

414. *According to this System, what is the first division made of the Vegetable Kingdom?*—All the Genera of plants are first divided into the two Grand Divisions mentioned in § 21.

415. *Will you here repeat the characteristics of the Phænogàmia?*—They have such *stems*, *leaves*, *flowers* and *seeds* as have been already described in this book.

416. *The Cryptogàmia?*—These have often no regular stem, nor such leaves as have been described, *nor flowers of any kind;* and they produce, instead of seeds, minute, dust-like bodies called *spores.*

417. *What is the next step in the Natural System?*—The Phænogàmia or Flowering Plants are next separated into the two great subdivisions mentioned in § 110.

418. *Please recite their characters again.*

The EXOGENS have the wood in circular layers,
— the leaves with netted veins,
— the flowers four or five-parted, and
— the seeds with two or more cotyledons.

The ENDOGENS have the wood in confused order,
— the leaves with parallel veins,
— the flowers three-parted, and
— the seeds with one cotyledon.

419. *What is the third step in this System?*—The Exogens are divided into two Natural Classes, namely, the Angiosperms and Gymnosperms.

420. *How are these two Classes to be distinguished?*—By the following marks.

The A'NGIOSPERMS have stigmas as well as stamens in the flowers, and
— fruit consisting of a pericarp enclosing the seeds.

The GY'MNOSPERMS have no stigmas in their flowers, and
— fruit consisting of *naked seeds*, not enclosed in an ovary or pericarp; as, the Pines, Spruces and Firs.

421. *Will you now tell us how the Angiosperms are divided?*—They are usually divided into three sub-classes, as follows:

The POLYPÉTALÆ, having calyx and corolla, the latter with *distinct* petals.

The MONOPÉTALÆ, having calyx and corolla, the latter with *united* petals.

The APÉTALÆ, having no corolla and often no calyx.

422. *We will now return to the Endogens: how are they divided?*—Into two very distinct Natural Classes, whose characters are as follows, viz.:

The AGLUMÀCEÆ, having flowers without glumes, and
The GLUMÀCEÆ, having flowers furnished with glumes, or chaff.

423. *How are the Cryptogamia divided?*—Also into two Natural Classes, thus named and distinguished:

The A'crogens, having a regular stem with leaf-like appendages, and

The Thállogens, plants of the lowest grade, with no distinction of root, stem and leaves.

424. *In the following table these six Classes, together with the other principal divisions of the Natural System, are so arranged as to show their relations to each other at a glance. Please repeat and explain it.*

Vegetable Kingdom,	Phænogàmia,	E'xogens,	A'ngiosperms.	Class 1.
			Gy'mnosperms.	" 2.
		E'ndogens,	Aglumàceæ.	" 3.
			Glumàceæ.	" 4.
	Cryptogàmia,		A'crogens.	" 5.
			Thállogens.	" 6.

425. *Another table of the Natural Classes is here given, showing their most essential characters. The pupil is requested to explain it, and decide by it the Class to which any plant at hand belongs.*

A VIEW OF THE NATURAL CLASSES, &c.

1 Plants bearing flowers (Phænogamia)....2
1 Plants never bearing flowers (Cryptogamia) ...5
2 Leaves net-veined. Flowers never entirely 3-parted (Exogens)....3
2 Lvs. parallel-veined (rarely net-veined). Fls. 3-parted (Endogens)....4
3 Stigmas present. Seeds enclosed in a pericarp.....6 Angiósperms, I.
3 Stigmas none. Sds. quite naked (Pines, Spruces, &c.) Gy'mnosperms, II.
4 Flowers without glumes, mostly colored .... Aglumàceæ, III.
4 Flowers with glumes, and always colorless............... Glumàceæ, IV.
5 Stems and leaves distinguishable...................... A'crogens, V.
5 Stems and leaves undistinguishable..................Thállogens, VI.
6 Corolla with distinct petals.............................Polýpetalæ.
6 Corolla with united petals...............................Monopetalæ.
6 Corolla none. Sepals united or none............................Apetalæ.

§. OF THE NATURAL ORDERS.

426. *What is remarked concerning the Natural Orders or Families?*—These are the most important of all the natural associations. Botanists have taken the greatest pains to render the characters of the Orders accurate and distinct, and the student's progress will chiefly depend on his knowledge of them.

427. *How are Orders formed?*—By placing together those Genera which most nearly resemble each other in character and properties.

428. *Can you give an illustration?*—The Cruciferæ, or the Mustard family includes all those Genera which have cruciform flowers, siliquose fruit, didynamous stamens, alternate leaves, no stipules, &c.; as Mustard, Cabbage, Turnip, Radish, Rocket, Shepherd's-purse, &c.

429. *What say you of the number of Genera in the different Orders?*—The number is very variable. Some Orders are made up of a single Genus, as the Nelumbiaceæ (Order 8), while others embrace several hundred Genera, as the Compositæ (Order 75).

430. *Can you now recite the various divisions of the Natural System?*—In the Natural System, Individuals form Species,
Species form Genera,
Genera form Orders,
Orders form Classes,
Classes form Grand Divisions, and
Two Grand Divisions constitute the Vegetable Kingdom.

LESSON XXI.

CONCERNING THE ANALYSIS OF PLANTS

431. *Define the term Analysis.*—The study of any object by the separate examination of its parts, is called ANALYSIS.

432. *Illustrate.*—Thus, in Grammar we analyze a sentence when we point out and separately consider the *subject*, the *predicate*, the *object*, with their *modifiers*, &c. In Chemistry we analyze water

when we separate it into its two elements, *oxygen* and *hydrogen*, and examine them apart.

433. *What then is Analysis in Botany?* — Botanical Analysis implies a separate examination of the several parts or organs of which a plant is composed, according to the rules of the Science, in order to determine its characters, affinities, names, habits, properties and uses.

434. *What is the pursuit of the active Botanist?*—He is diligently and delightfully employed in the discovery and analysis of plants. For without this exercise, the study of books would lose half its usefulness and pleasure. The student can gain a better knowledge of a plant in a few minutes, by a careful examination of a living specimen, than by committing to memory the longest descriptions found in books.

435. During the flowering months, you may often in your walks meet with plants in blossom with which you are unacquainted. If you are duly interested in your study, and are sufficiently advanced, you will not fail to seize and analyze each new specimen while the short hour of its bloom may last, and even extend your walk in search of more. Thus in a few seasons you may become acquainted with about every species that is found in the vicinity.

436. But we do not expect this object will be accomplished by our young friends while engaged in the study of the "First Lessons in Botany." We only aim *now* to furnish you with the means of making a *good beginning* in this interesting and improving labor, so that you may be able to go forward, in future seasons, with the "Class-Book of Botany," or other works of that rank.

437. In the following pages we present you with many useful tables for Botanical Analysis, accompanied by a miniature FLORA, or a partial description of all the Flowering plants in the United States. (*See Suggestions to Teachers, page* 5.)

§ PARTICULAR DIRECTIONS IN ANALYSIS.

438. *What is the proper condition of a plant for analysis?*—It should have flowers in full bloom, and if possible, a portion of them in fruit also, and accompanied with full-grown leaves. And when

you gather specimens, do not think it sufficient to gather the flowers with some of the *upper* leaves, but if the plant be an herb, take care to gather some of the *lower* leaves also.

439. *Let us now suppose you have found a plant in the proper state for analysis; what is the first step which you are to take?*—I should first carefully examine the several *parts* of the plant, one by one, beginning with the root and ending with the ovaries, and determine their characters according to the definitions in the former Lessons.

440. *After having thus gained a good knowledge of the specimen, what next?*—I should next refer to the "View of the Natural System" on page 79, commencing as near the beginning as necessary, reading, comparing and deciding, in order to learn the Natural Order of the plant.

441. *And what then?*—Turn to that Order, and learn its genus and species in the same manner.

442. *What care is to be taken throughout the whole examination?*—I should take the greatest care *to avoid mistakes.*

443. *The following are some of the best and safest distinctions, deserving particular notice. Will you state what you inquire respecting the Plants?*—Whether they are herbs, shrubs, or trees. (§ 58–62.)

444. *The Stipúles?*—Whether present or wanting. (§ 224.)

445. *The Leaves?*—Whether alternate or opposite,—parallel-veined or net-veined; whether the figure be ovate, or oval, or lanceolate, &c. (Less. VI.)

446. *The Flowers?*—Whether symmetrical or unsymmetrical (§ 336), regular or irregular. (§ 338.)

447. *The Calyx?*—Whether free, half-free, or adherent. (§ 273.)

448. *The Petals?*—Whether united or distinct; whether alternate with the stamens or opposite to them.

449. *The Stamens?*—Whether hypogynous, perigynous, or epigynous. (§ 309, &c.)

450. *The Carpels?*—Whether single or several, distinct or united. (§ 317.)

§. VARIOUS SUGGESTIONS, CAUTIONS, &c.

451. *How much acquaintance with the characters of the Six Natural Classes is needful?*—The student should understand them so well as to be able, at first sight, to determine to which of them any plant belongs.

452. *Are their characters always obvious and certain?*—They are *generally*, but we must not be surprised to find some exceptions.

453. *In the Natural System, will any* ONE *character alone distinguish all the plants of any Class or Order?*—It will not; but a *combination* of characters is often needed.

454. *Explain your meaning by an example or two.*—Although net-veined leaves are in general characteristic of Exogens, and parallel-veined of Endogens, yet there are a few Exogens with parallel-veined leaves and a few Endogens with net-veined. Again, although 3-parted flowers are in general characteristic of Endogens, a few of them have 4-parted and 2-parted, while several of the Exogens have 3-parted. Therefore we must combine these two distinctions of leaves and flowers, in order to make out a distinction that will answer in all cases.

455. *How combine them?*—Thus: No Exogen has its flowers *completely* 3-parted (that is, sepals, petals, stamens and carpels, all in 3s); hence if your plant have such flowers, however its leaves may be, it is an Endogen, &c. See the 2d couplet (or pair of lines) in the "View of the Natural Classes," p. 81.

456. *How may we most readily know an Angiosperm?*—The Angiosperms may always be known by the presence of stigmas in their flowers, and the Gymnosperms by having no stigmas; but as this is often an obscure character, it is well to remember that all the Gymnosperms, or plants without stigmas, are trees and shrubs; such as the Pines, Spruces, Cedars, &c., and (except the Larch) evergreen.

457. (We shall close this lesson by briefly stating the characters of the following eight Natural Orders. As they are very easily defined, and very large, embracing more than one-third of all our flowering plants, it will greatly aid the learner, and save his too frequent reference to the tables, to commit these brief distinctions to memory.)

EXOGENS.

458. *Please state carefully the characters of the Crùcifers.*—They are herbs with alternate leaves cruciform flowers (§ 288), 2 stamens shorter than the other 4, and 2-celled pods. (Artificial class, Tetradynamia, § 310, 315.) Example, Mustard.

459. *Of the Legùminous family.*—Plants with 1-celled pods (§ 162), and mostly papilionaceous corollas (§ 292) and compound leaves (§ 154). (Artificial Class Diadelphia, nearly. § 311, 17.) Pea.

460. *The Umbìlifers.*—Herbs with alternate leaves, small, regular, 5-parted flowers in umbels, and 2-seeded fruit. Caraway.

461. *The Compósite Family.*—Herbs with compound flowers, that is, with heads composed of many minute 5-parted flowers, appearing together like a single flower (§ 253). Asters, Sunflower. (Artificial Class Syngenesia, § 311, 19.)

462. *The Labiàte Family.*—Herbs with square stems, opposite leaves, labiate flowers (§ 285), and fruit deeply-cleft into four parts. Peppermint.

ENDOGENS.

463. *The O'rchids.*—Herbs with very irregular and grotesque flowers, and stamens united to the style. (Artificial Class Gynandria, § 311, 20.) Orchis.

464. *The Sedges.*—Herbs with solid stems, linear, grass-like leaves (if any) on entire sheaths, and with green glumes and flowers.

465. *The Grasses.*—Herbs with hollow stems, linear leaves on split sheaths, and with green glumes and flowers.

LESSON XXII.

ABOUT PRESERVING PLANTS.

466. *In what light may the preservation of Plants be regarded?*—Almost as one of the Fine Arts; for in the practice of it there is room for the exhibition of much taste and skill, and when prepared

in *a proper manner*, an HERBARIUM is a truly beautiful and interesting work.

467.—*What apparatus is necessary in collecting plants?*—A tin box of some convenient form, about 18 inches in length, shutting closely. In such a box gathered specimens may be kept several days fresh and unfading.

468. *What apparatus for drying them?*—1st, a dozen quires of soft, unsized paper (such as printing paper or old newspapers), about 15 inches long and 11 inches wide when folded; 2nd, a small quantity of cotton batting; 3d, a small screw press with boards of the same size as the paper, or several lead weights varying from 12 to 30 pounds each.

469. *What are the directions to be observed in gathering specimens for the herbarium?*—The same as have already been given for analysis (§ 438).

470. *State next the process of pressing and drying.*—The specimens are to be freed from water (if gathered in the dew or in a wet day), and then spread out as nearly in their natural position as possible. between about 12 thicknesses of paper. Then let them be submitted to pressure, but the pressure should be equalized by the cotton batting, and should never be severe enough to *crush* the parts.

471. *How often should they be changed?*—As often as once or twice each day until perfectly dry, they should be transferred to fresh and dry paper. It is also well to keep the press in a *warm* place. By carefully observing all these directions, your dried specimens will retain *almost* all the beauties of the living plant.

472. *What is the next object with the collector?*—To arrange his specimens. For this purpose he procures a quantity of fine, white, rather firm paper, about 14 inches long and 10 inches wide when folded, and between the folds of each sheet places the specimens of one species, together with a card labeled with its names, &c.

473. *Are there any directions respecting the label?*—In writing the Latin names of the species, commence them with a capital or a small letter *just as you find them* in the book you use. The rules respecting these things perhaps you will hereafter learn in the Class-Book of Botany (page 118, second edition).

SYNOPSIS,

OR

REVIEW OF THE NATURAL SYSTEM,

BY WHICH THE STUDENT MAY READILY DETERMINE THE NATURAL ORDER OF *ANY FLOWERING* PLANT GROWING WITHIN THE LIMITS OF THE U. STATES.

NOTE.—A star (*) annexed to the number of a Natural Order denotes that *that* Order, with its Genera and Species, is described in its place in the Flora. Those orders not thus marked are not noticed in the Flora beyond this Synopsis. The Orders are here numbered as in the "Class Book of Botany."

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§ *Classes and Sub-classes.*

1 Plants bearing flowers....2 (**Phænogamia.**)
1 Plants never bearing flowers....5 (**Cryptogamia.**)
2 Leaves net-veined. Flowers never entirely 3-parted....3 (**Exogens.**)
2 Lvs. parallel-veined (rarely net-veined). Fls. 3-parted....4 (**Endogens.**)
3 Stigmas present. Seeds enclosed in a pericarp....6 (**Angiosperms. 1.**)
3 Stig. none. Seeds quite naked (Pines, &c.)....144 (**Gymnosperms. 2.**)
4 Fls. without glumes, mostly colored, often green....145 (**Aglumaceæ. 3.**)
4 Fls. with green glumes, no perianth, and 1-seeded fr.....167 (**Glumaceæ. 4.**)
5 Stems and leaves distinguishable........................(**Acrogens. 5.**)
5 Stems and leaves undistinguishable...................(**Thallogens. 6.**)
6 Corolla with distinct petals....7 (**Polypetalæ.**)
6 Corolla with united petals....76 (**Monopetalæ.**)
6 Corolla none. Sepals sometimes none....117 (**Apetalæ.**)

§§ *Orders of the Polypetalous Exogens.*

7 Herbs (§ 62)....8
7 Shrubs and trees (§ 59, 60)....54
8 Leaves alternate or all radical....9
8 Leaves cauline (§ 146), opposite, at least the lower ones....38
9 Stipules present (§ 244)....34
9 Stipules none....10

10 Polyandrous—stamens (15—200) indefinite....11

10 Oligandrous—stamens few, definite....17

11 Stamens hypogynous—situated on the receptacle (§ 314, 13)....12

11 Stamens perigynous—situated on the calyx or corolla (§ 314, 12)....16

12 Ovaries simple; fruit acheniate, folliculate, &c., never capsular....13

12 Ovaries united into a compound capsule....15

13 Leaves never peltate, mostly many-cleft. *Crowfoots*....RANUNCULÀCEÆ. 1*

13 Lvs. centrally peltate (§ 173, 23). Plants aquatic (growing in water)....14

14 Sepals and petals definite (2—4). Lvs. oblong. *Watershields*. CABOMBÀCEÆ. 7

14 Sepals and petals indefinite, numerous. Leaves orbicular. NELUMBIÀCEÆ. 8*

15 Sepals and petals numerous, indef. Plants aquatic....NYMPHÆÀCEÆ. 9*

15 Sepals and petals 5. Lvs. pitcher or trumpet form....SARRACENIÀCEÆ. 10*

15 Sepals 2. Juice usually colored. *Poppyworts*.........PAPAVERÀCEÆ. 11*

16 Sepals and petals 5—10....75

16 Sepals and petals many and undistinguishable. *Indian Figs*. CACTÀCEÆ. 61

17 Flowers very irregular....18

17 Flowers regular or nearly so....20

18 Filaments 6 or 8, united below into one or two sets....19

18 Filaments 5, cohering only at top. *Jewel-weeds*........BALSAMINÀCEÆ. 28

18 Filaments 8, distinct. Lvs. simple, peltate. *Trophyworts*. TROPÆOLÀCEÆ. 29

18 Fils. 8, distinct. Lvs. biternate, with tendrils. *Soapworts*. SAPINDÀCEÆ. 44

19 Leaves much dissected and divided. *Fumeworts*........FUMARIÀCEÆ. 12

19 Leaves simple, entire. *Milkworts*..................POLYGALÀCEÆ. 16*

20 Ovaries superior—free from the calyx or nearly so (§ 328)....21

20 Ovaries inferior—wholly adherent to the calyx (§ 328)....32

21 Sepals 2. Fleshy herbs. *Purselanes*................PORTULACÀCEÆ. 24

21 Sepals 3 or more....22. (Leafless, and not green....93)

22 Stamens hypogynous—inserted on the receptacle....23

22 Stamens perigynous—inserted on the calyx....31

23 Sepals, petals and stamens symmetrical (§ 336)....24

23 Sepals, petals and stamens unsymmetrical. Fruit a pod....29

24 Carpels solitary, fruit simple, 1-celled. *Berberids*.......BERBERIDÀCEÆ. 6*

24 Carpels 3—5, more or less united....25

25 Leaves simple....26

25 Leaves compound....27

26 Ovary and capsule 1-celled. Aquatic plants. *Sun-dews.* Droseràceæ. 18*
26 Ovary and capsule 5—10-celled. Stamens 5. *Flaxworts*......Linàceæ. 26
26 Ovary and capsule 5-celled. Stamens 10....83
27 Plants aquatic. Fr. 2—5 fleshy nuts. Juice acrid. *Floerkea.* Limnanthes. 30
27 Plants not aquatic....28
28 Leaves palmately 3-foliate. Juice acid. *Wood-sorrels*...Oxalidàceæ. 31*
28 Leaves pinnate. Juice bitter. *Rueworts*...................Rutàceæ. 34
29 Fls. crucif. (§ 288). Pods 2-carp., 2-celled. *Mustardworts.* Crucíferæ. 13*
29 Flowers not cruciform....30
30 Pods 2-carpeled, 1-celled. *Capparids*.................Capparidàceæ. 14
30 Pods 3—6-carpeled, 1-celled. *Mignionettes*...............Resedàceæ. 15
31 Styles 5. Stamens 5, opposite to the petals. Fruit 1-celled....85
31 Styles 3—20, as many as the sepals. *Houseleeks*......Crassulàceæ. 64*
31 Styles 3, fewer than the sepals. *S. Turnera*..........Turneràceæ. 58
31 Styles 2, fewer than the sepals. *Saxifrages*.........Saxifragàceæ. 65*
31 Styles (or stigmas) 4, fewer than sepals. *Parnassia*....Droseràceæ. 18*
32 Flowers in simple or compound umbels....33
32 Flowers in racemes, or solitary, &c. *Evening Primroses.* Onagràceæ. 55*
33 Carpels 2, dry, separable, 1-seeded, indehiscent.......Umbellíferæ. 67*
33 Carpels 2—5, inseparably combined into a berry or drupe. Araliàceæ. 68
34 Flowers regular....35
34 Flowers irregular....36
35 Stamens monadelphous (§ 311, 16)—filaments united.....Malvàceæ. 37*
35 Stamens distinct. *Roseworts*..........................Rosàceæ. 48*
36 Fruit a 3-celled capsule....37
36 Fruit a legume (§ 362), with 1 or several seeds..........Leguminòsæ. 47*
37 Capsule with 3 broad wings. Monœc. (§ 312, 21). *Begonia.* Begoniàceæ. 58
37 Capsule not winged. Flowers perfect. *Violets*.......... Violàceæ. 17*
38 Stipules present, sometimes very small....39
38 Stipules none....41
39 Ovaries 5, distinct and 1-seeded in fruit. *Gerania.* ...Geraniàceæ. 27*
39 Ovary compound, 1—5-celled....40.
40 Sepals, petals and stamens 5. *Knotworts*..............Illecebràceæ. 22
40 Sepals, petals, stamens and styles 2 or 3. Aquatic plants..Elatinàceæ. 25
41 Flowers very irregular. *Milkworts*.................Polygalàceæ. 16*
41 Flowers regular, or slightly unequal....42

42 Ovaries inferior or adhering to the calyx....43
42 Ovaries superior or free from the calyx....45
43 Cal. adher. only to the angles of the ova. *Deer Grass.* MELASTOMÀCEÆ. 51
43 Calyx tube wholly adherent to the ovary....44
44 Involucre 4-leaved, white, subtending the small cyme......CORNACEÆ. 69*
44 Involucre none. Leaves numerous. *Onagrads*.........ONAGRÀCEÆ. 55*
44 Invol. none. Leaves 3 only, compound. *Ginseng*, *Panax*. ARALIÀCEÆ. 68
45 Ovaries many, distinct, simple, acheniate, caudate..RANUNCULÀCEÆ. 1*
45 Ovary 1, simple. Lvs. 2 only. *Podophyllum*, *May Apple*. BERBERIDÀCEÆ. 6*
45 Ovary compound....46
46 Sepals 2, fewer than the petals. *Purselanes*........... PORTULACACEÆ. 24
46 Sepals 3—5, more or less united....47
47 Styles united into one....48
47 Styles distinct....49
48 Sepals equal, combined into a tube. *Loose-strifes*.........LYTHRÀCEÆ. 52
48 Sepals unequal, nearly distinct. *Rock-roses*................CISTÀCEÆ. 19
49 Stamens hypogynous (arising from the receptacle)....50
49 Stamens perigynous (arising from the calyx)....51
50 St. tumid at the nodes. Lvs. not punctate. *Pinkworts.* CARYOPHYLLÀCEÆ. 23*
50 Stem often 2-edged. Leaves with pellucid and black dots. HYPERICÀCEÆ. 20*
51 Sta. 20 or more, indefinite. Exotic plants. *Ice-plants.* MESEMBRYÀCEÆ. 62
51 Stamens fewer than 20, definite....52
52 Carpels (follicles) distinct, as many as the sepals.......CRASSULÀCEÆ. 64*
52 Carpels 2—5, partly or completely united....53
53 Styles 3—5. Embryo coiled around the albumen. CARYOPHYLLÀCEÆ. 23*
53 Sty. 2. Embryo straight in the midst of the albumen. SAXIFRAGÀCEÆ. 65*
54 Leaves opposite....55
54 Leaves alternate....65
55 Stipules present, but soon falling off. Shrubs. *Staff-trees.* CELASTRÀCEÆ. 45
55 Sti. present, between the petioles. Trees. *S. Mangle.* RHIZOPHORÀCEÆ. 53
55 Stipules none....56
56 Flowers irregular. *Horse-chestnuts. Buckeyes*.......HIPPOCASTANÀCEÆ. 43
56 Flowers regular....57
57 Stamens 20 or more, indefinite....58
57 Stamens fewer than 20, definite....61

58 Ovary superior—free from the calyx....60
58 Ovary inferior—adherent to the calyx....59
59 Ova. comp., of 3—5 carpels. Lvs. dotted. *St. Johnsworts.* HYPERICÀCEÆ. 20*
59 Ova. 00, simp., enclosed in the fleshy cal. *Car. Allspice.* CALYCANTHÀCEÆ. 49
60 Styles united into one. *Myrtleblooms*....................MYRTÀCEÆ. 50
60 Styles 4, distinct. *Philadelphus. False Syringa*........SAXIFRAGÀCEÆ. 65*
61 Ovary superior—free from the calyx....62
61 Ovary inferior—adherent to the calyx....63
62 Fruit a 1-celled capsule. Low undershrubs (§ 61). *Rock-roses.* CISTÀCEÆ. 19
62 Fr. 2 united samaræ (§ 379). Erect shrubs and trees. *Maples.* ACERÀCEÆ. 42*
62 Fruit a 2-seeded berry. *Grape-vines*........................VITÀCEÆ. 38
63 Sty. 2, distinct. Cymes radiate (§ 255, *a*). *Hydrangea.* SAXIFRAGÀCEÆ. 65*
63 Styles united into one....64
64 Flowers axillary, solitary. Delicate house shrub. *Fuchsia.* ONAGRÀCEÆ. 55*
64 Fls. in cymes. Drupe 1—2-celled. Large shrubs or trees. CORNÀCEÆ. 69*
64 Fls. spicate or fascicled. Small parasites (§ 46). *Misseltoes.* LORANTHÀCEÆ. 79
65 Stip. large or small, sometimes only 2 glands, or found in the bud only..66
65 Stipules none. Flowers regular....70
66 Flowers regular....67
66 Flowers more or less irregular. *Leguminous Plants*.....LEGUMINÒSÆ. 47*
67 Stamens 4 or 5, distinct. Erect shrubs....68
67 Sta. 5, united into one set. Climbing. *Passionflowers.* PASSIFLORÀCEÆ. 57
67 Stamens 20 or more, indefinite....69
68 Stamens opposite to the petals. *Buckthorns*...............RHAMNÀCEÆ. 46
69 Stamens alternate with the petals. *Staff-trees*...........CELASTRACEÆ. 45
69 Filaments distinct, hypogynous. Flowers very large. MAGNOLIACEÆ. 2*
69 Filaments distinct, perigynous. *Roseworts*................ROSACEÆ. 48*
69 Filaments united into one set. Shrubs. *Mallows*.......MALVACEÆ. 37*
69 Filaments united into 5 sets. Fls. small. Trees *Bass-wood.* TILIACEÆ. 38
70 Fls. monœcious. Trailing vines. *South. Schizandra*....SCHIZANDRACEÆ. 4
70 Flowers diœcious. Climbing vines. *Moonseeds*.......MENISPERMACEÆ. 5
70 Flowers diœcious. Erect shrubs....71
70 Flowers perfect....72
.1 Ovary superior—free from the calyx. *Prickly Ash.* ZANTHOXYLACEÆ. 32
71 Ovary inferior. Unarmed shrub. *Witch-hazel*......HAMAMELACEÆ. 66

72 Stamens 18 or more, indefinite....73
72 Stamens 5, separate, standing on the calyx (perigynous, § 309, 12)....74
72 Sta. 5, 8, 10 or 14, separate, on the recept. Ovary free. Lvs. simple....114
72 Sta. 10, filaments united. Lvs. bipinnate. *Pride of India*....MELIACEÆ. 39
72 Sta. 10, separate. Leaves simple. Ovary inferior. *S*....COMBRETACEÆ. 54
72 Stamens 6, opposite to the petals. *Berberids*..........BERBERIDACEÆ. 6*
72 Stamens 4, alternate with the petals. *Corneils*...........CORNACEÆ. 69*
73 Fruit large fleshy pods. Calyx and cor. 3-parted. *Papaw*. ANONACEÆ. 4*
73 Fruit a several-celled capsule. Flowers 5-parted. TERNSTRŒMACEÆ. 36
73 Fruit a many-celled berry (orange § 383). *Orangeworts*. AURANTIACEÆ. 35
73 Fruit 5 follicles, or a drupe, or a pome, or a compound berry...Ros. 48*
74 Fruit a dry, 1-seeded drupe. *Sumacks*................ANACARDIACEÆ. 33
74 Fruit a 2-celled, many-seeded capsule. *Itea*...........SAXIFRAGACEÆ. 65*
74 Fruit a 1-celled, globose berry. *Currantworts*..........GROSSULACEÆ. 60*
74 Fruit a 5-celled baccate drupe. *Araliads*.................ARALIACEÆ. 68
75 Styles several, distinct. *Roseworts*........................ROSACEÆ. 48*
75 Styles united into one. *Loasads, Bartonia*................LOASACEÆ. 56

§§§ *Orders of the Monopetalous Exogens.*

76 Herbs, annual, biennial or perennial....77
76 Trees, shrubs or under-shrubs....106
77 St. juicy, prostrate or climb., with tendrils. *Gourdworts*. CUCURBITACEÆ. 59
77 Stem not furnished with tendrils....78
78 Leaves alternate or all radical....79
78 Leaves opposite, cauline....95
78 Leaves none. Plants without verdure....93
79 Flowers regular, or else ligulate....80
79 Flowers irregular....90
80 Stamens 5, cohering by the anthers. Fls. in heads (§ 253). COMPÓSITÆ. 75*
80 Stamens 4—10, distinct (or united and flowers not in heads)....81
81 Ovary inferior—adherent to the calyx tube....82
81 Ovary superior—free....(stamens 6, in 2 sets. A vine....19)....83
82 Stamens as many as the lobes of the corolla. *Bellworts*. CAMPANULACEÆ. 77*
82 Stamens twice as many as the lobes of the corolla.........ERICACEÆ. 78*

83 Stamens twice as many as the slightly united petals.....Ericaceæ. 78*

83 Stamens as many as the lobes of the corolla....84

84 Stamens opposite to the lobes of the corolla....85

84 Stamens alternate with the lobes of the cor. Styles united into one....86

85 Ovary many-seeded. *Primroseworts*..................Primulaceæ. 89*

85 Ovary 1-seeded. Petals scarcely united. *Leadworts.* Plumbaginaceæ. 85

86 Acaulescent (§ 81). Fls. spicate. Fr. a pyxis. *Plantains.* Plantaginaceæ. 84

86 Caulescent. Stems leafy....87 (Fls. with a 5-hooded crown....105)

87 Fruit 4 nearly distinct achenia, or deeply 4-lobed......Borraginaceæ. 94*

87 Fruit 2 long, slender follicles. Flowers blue. *Amsonia.* Apocynaceæ. 101*

87 Fruit compound, capsular or baccate....88

88 Cor. twisted and imbricated in the bud. Fls. smallish. Polemoniaceæ. 96*

88 Cor. twisted and folded in the bud. Fls. quite large. Convolvulaceæ. 98*

88 Corolla in the bud not twisted....89

89 Fruit a few (2—4)-seeded capsule. *Hydrophylls.* Hydrophyllaceæ. 95*

89 Fruit a many-seeded capsule or berry. *Nightshades*.....Solanaceæ. 99*

90 Ovary adherent to the calyx—inferior. *Lobeliads*.........Lobeliaceæ. 76*

90 Ovary free from the calyx—superior....91 (Ov. 4-parted....87)

91 Stamens 2 or 4 and didynamous (§ 310, 14)....92

91 Stamens 5. Corolla slightly unequal....116

91 Stamens 5—8. Corolla very irregular, or fungous....18

91 Stamens 10. Corolla papilionaceous....36

92 Ovary 1-celled. Acaulescent, aquatic. *Bladderworts*.....Lentibulaceæ. 86

92 Ovary falsely 4-celled. Caulescent and not aquatic.......Pedaliaceæ. 89

92 Ovary regularly 2-celled. *Figworts*...............Scrophulariaceæ. 91*

93 Flowers regular. *Indian pipes. Monótropa*...............Ericaceæ. 78*

93 Flowers irregular....94

94 Erect herbs. Color reddish-white or brown. *Broomrapes.* Orobanchaceæ. 87

94 Twining parasitic vines, orange-colored, *Dodder*.....Convolvulaceæ. 98*

95 Herbs with a watery juice....96

95 Herbs with a milky juice. Fruit one or two follicles....105

96 Corolla limb quite regular, or else ligulate....97

96 Corolla limb more or less irregular....102

97 Flowers small, 1-seeded, in dense, involucrate heads....Compositæ. 75*

97 Flowers in umbels, racemes, &c., not involucrate....98

98 Ovaries inferior—adherent....99
98 Ovaries superior, or nearly so....100
99 Fruit with 2 or more seeds. *Madderworts*...............RUBIACEÆ. 72*
99 Fruit with but one perfect seed. *Valerians*..........VALERIANACEÆ. 73
100 Fruit 4 nearly distinct achenia. Stamens 4...............LABIATÆ. 93*
100 Fruit a 2-celled, or twin capsule. Stamens 5. *Pinkroot*...RUBIACEÆ. 72*
100 Fruit a 3-celled capsule. Stamens 5. Fl. bud twisted. POLEMONIACEÆ. 98*
100 Fruit a 1-celled capsule, many-seeded. Stamens 4—12....101
101 Stamens opposite to the petals. *Primroseworts*........PRIMULACEÆ. 82*
101 Stamens alternate with the petals. *Gentianworts*...GENTIANACEÆ. 100*
102 Ovary inferior—adherent to the calyx tube....103
102 Ovary superior—free from the calyx....104
103 Flowers in dense, involucrate heads. *Teazelworts*........DIPSACEÆ. 74
103 Flowers solitary or twin. *Honeysuckles*............CAPRIFOLIACEÆ. 71*
104 Ova. and caps. 2-celled, many-seeded. Sds. albuminous... SCROPHUL. 91*
104 Ova. and caps. 2-celled; sds. few, on hooks, without album. ACANTHACEÆ. 90
104 Ova. 1—4-seeded, entire, separat. into as many little nuts. VERBENACEÆ. 92
104 Ovary deeply 4-lobed, forming 4 distinct achenia in fruit....LABIATÆ. 93*
105 Fls. with corona or crown, in umbels. *Silk-grasses*. ASCLEPIADACEÆ.102*
105 Flowers with no corona, in cymes. *Dogbanes*.......APOCYNACEÆ.101*
106 Leaves alternate....112
106 Leaves opposite....107
107 Ovary superior....109
107 Ovary inferior....108
108 Stipules present. Stamens 4. Flowers in globose heads. RUBIACEÆ. 72*
108 Stipules (mostly) none. Stamens 5. *Honeysuckles*....CAPRIFOLIACEÆ. 71*
109 Fls. irregular. Perfect stamens 2 or 4. *Bignoniads*....BIGNONIACEÆ. 88
109 Flowers regular....110
110 Sta. 10, twice as many as the corolla lobes. *Heathworts*....ERICACEÆ. 78*
110 Stamens 5, as many as the corolla lobes. *Dogbanes*....APOCYNACEÆ.101*
110 Stamens 2, fewer than the corolla lobes....111
111 Corolla imbricate and twisted in the bud. *Jasmines*...JASMINACEÆ. 103
111 Corolla valvate in the bud. *Oliveworts*. *Ash*..........OLEACEÆ. 104
112 Ovary superior....114
112 Ovary inferior....113

113 Flowers in an involucrate head—compound...........Compositæ. 75*
113 Fls. in racemes, &c. Stamens distinct. Fruit a berry...Ericaceæ. 78*
113 Fls. in racemes, &c. Sta. united. Fr. a winged drupe. Styracaceæ. 81
114 Stamens (hypogynous) inserted *with* the cor. *Heathworts*..Ericaceæ. 78*
114 Sta. (perigynous) inserted on the top of the cor. tube...Diapensiaceæ. 97
114 Stamens (perigynous) inserted on the corolla tube inside....115
115 Stamens twice as many as the petals, all perfect........Ebenaceæ. 80
115 Sta. twice as many as the petals, half of them sterile....Sapotaceæ. 83
115 Stamens as many as the petals (lobes of the corolla)....116
116 Drupe with 3—6 one-seeded cells. *Hollyworts*........Aquifoliaceæ. 79
116 Berry or pod 00-seeded. Lvs. not decurrent. *Nightshades.* Solanaceæ. 99*
116 Pod 2-celled, 00-seeded. Leaves alternate. *Mullein.* Scrophulariaceæ. 91*

§§§§ *Orders of the Apetalous Exogens.*

117 Herbs....(Stem endogenous, flowers on a spadix....164)....118
117 Trees, shrubs, and under-shrubs....131
118 Leaves alternate or all radical....119
118 Leaves opposite....124
119 Stipules sheathing above the nodes. *Knot-grasses*....Polygonaceæ. 110*
119 Stipules conspicuous, serrate, but not sheathing the stem....35
119 Stipules 0, or if present, not sheathing nor serrate....120
120 Fruit a berry, 10-carpled and 10-seeded. *Garget-poke.* Phytolaccaceæ. 111*
120 Fr. 3-carpl'd, 3-sdd, split'ng into 3 nutlets. *Spurgeworts.* Euphorbiaceæ. 121
120 Fruit 4-seeded. Calyx none. Stamens 7. *Lizard-tail*...Saururaceæ. 117
120 Fruit many distinct achenia....13
120 Fruit capsular, 3—6-celled, many-seeded....121
120 Fruit a solitary 1-celled, 1-seeded utricle....122
121 Fls. with a lurid-colored cal. of 3 sep. *Birthworts.* Aristolochiaceæ. 105
121 Flowers with a yellowish-green calyx of 5 sepals....31
121 Fls. green, of 2 or 3 bracts under water. *Threadfoot.* Podostemiaceæ. 120
122 Sep. white, connected to the anth. by threads. *Comandra.* Santalaceæ. 113
122 Sepals dry and scarious, with scarious bracts around..Amarantaceæ. 108
122 Sepals green, minute....123
123 Flowers perfect. *Chenopods.* *Pig-weeds*........Chenopodiaceæ. 106

123 Flowers monœcious or diœcious. *Nettleworts*.........URTICACEÆ. 130
124 Stipules present. *Nettleworts*.........................URTICACEÆ. 130
124 Stipules none....125
125 Flowers with a calyx only....126
125 Flowers with neither calyx nor corolla....130
125 Fls. with a color'd invol. Pod 3-s'ded *Spurgeworts.* EUPHORBIACEÆ. 121
126 Stamens numerous, indefinite. Sepals colored....13
126 Sta. 10, calyx green, with a 1-seeded utricle. *Knawel.* SCLERANTHACEÆ. 107
126 Stamens 1, 3, 4, 5, 8....127
127 Cal. large, colored, funnel-form, limb entire. *Four-o-clock.* NYCTAGIN. 109
127 Calyx small, limb 3—5-lobed....128
128 Ovary inferior, 1—4-celled, 1—4-seeded....32
128 Ovary inferior, 1-celled, many-seeded....31
128 Ovary superior, or free....129
129 Capsule 1-celled, 5-seeded, calyx colored....101
129 Capsule 1-celled, many-seeded, calyx green....50
129 Utricle 1-seeded, calyx dry, with dry, colored bracts. AMARANTACEÆ. 108
130 Leaves verticillate. Ovary 1-seeded. *Hornworts.* CERATOPHYLLACEÆ. 118
130 Leaves opposite. Ovary 4-seeded. *Water Starworts.* CALLITRICHACEÆ. 119
131 Leaves alternate....132
131 Leaves opposite. Flowers not in catkins....139
132 Stipules present, often soon falling off....133
132 Stipules none....140
133 Juice milky. *Mulberryworts.* *Osage Orange*.........URTICACEÆ. 130
133 Juice watery, &c.....134
134 Flowers not in catkins; mostly perfect and with a calyx....135
134 Flowers in catkins, not perfect....136
135 Ova. inferior. Pod 3—6-celled. Shrubs. *Birthworts.* ARISTOLOCHIACEÆ. 105
135 Ovary superior. Fruit 1-seeded. Trees. *Elmworts*....ULMACEÆ. 116
135 Ovary superior. Fruit 3 or 4-seeded, nutlike....68
136 Aments pistillate and staminate, globular and pendulous. Trees..138
136 Aments pistillate and staminate, cylindric and oblong....137
137 Ovary 1-celled, 1-ovuled, fruit 1-seeded. *Galeworts*....MYRICACEÆ. 126
137 Ovary 2-celled, 2-ovuled, fruit 1-seeded. *Birchworts*..BETULACEÆ. 126*
137 Ovary many-ovuled, fruit many-seeded. *Willowworts*...SALICACEÆ. 127

138 Fr. 2-celled, several-seeded. *Liquidambar. Sweet gum*..Balsamif'luæ. 128
138 Fruit a 1-seeded, club-shaped nut. *Sycamores*........Platanàceæ. 129
139 Samara double, winged....62
139 Samara single, winged....111
139 Achenia enclosed in the berry-like calyx. *Oleasters.* Elæagnaceæ. 115
139 Pod of 3, 1-seeded, slightly-united nuts. *Box*......Euphorbiaceæ. 121
140 Fruit 1-celled. Ovary 1—2-ovuled....141
140 Fr. 3—9-celled. Fls. ☿. Evergreen shrubs. *Crowberries.* Empetraceæ. 122
141 Both ♀ and ♂ fls. in oblong aments. Shrubs.........Myricaceæ. 126
141 Only the staminate flowers in aments. Trees....143
141 None of the flowers amentaceous....142
142 Ova. inf. Fls. greenish. Drupe 1-seeded. *Sandalworts*...Santalaceæ. 113
142 Ova. sup. Cal. tubular, yellow or white. Shrubs. *Daphnads.* Thymela. 114
142 Ovary superior. Calyx deeply cleft. Prickly shrubs....71
142 Ovary sup. Calyx deeply cleft. Smooth shrubs. *Laurels*....Lauraceæ. 112
143 Leaves pinnate. *Walnuts. Butternuts*............Juglandaceæ. 123
143 Lvs. simple, straight-veined. *Mastworts, Oak, &c*...Cupulíferæ. 124

§§§§§ Orders of the Gymnosperms.

144 Stems branched. Lvs. simple. *Cônifers, Pine, Spruce, &c*...Coníferæ. 131
144 Stems simple. Leaves parallel-veined, pinnate. *Zamia*...Cycàdeæ. 132

§ Orders of the Aglumaceous Endogens.

145 Trees and shrubs....146
145 Herbs....148
146 Erect. Lvs. parallel-veined, fan-shaped, or pinnated. *Palms*..Palmeæ. 133
146 Climbing. Leaves net-veined, entire....147
147 Fruit a thin, 3-cornered capsule. *Yam-roots*.....Dioscoreàceæ. 150
147 Fruit a globose berry. *Sarsaparillas. Greenbriers*.....Smilaceæ. 151
148 Perianth complete, of 6 parts (or 4, white); never on a spadix....149
148 Perianth complete; flowers obscure, in a dense, roundish head....166
148 Perianth incomplete or none. Flowers mostly on a spadix....163

149 Perianth adherent to the ovary (in the perfect flowers)....150
149 Perianth free from the ovary....156
150 Fls. monœcious or diœcious. Plants in water. *Frogbits.* HYDROCHARID. 139
150 Flowers perfect. Plants terrestrial....151
151 Flowers regular....153
151 Flowers irregular....152
152 Stas. 1—2, adhering to the pistil (gynandrous § 311, 20)..ORCHIDÀCEÆ. 140*
152 Stamens 1, with half an anther, free from the pistil. *S.*...CANNACEÆ. 144
152 Stamens 3. *Irids.—Gladiolus. Corn-flag*.................IRIDACEÆ. 149*
153 Stamens 3....154
153 Stamens 6....155
154 Anth. opening inward (toward the pist.). Lvs. none. *S.* BURMANNIACEÆ. 141
154 Anth. opening inward. Lvs. sword-shap'd (ensiform). HÆMODORACEÆ. 148
154 Anthers opening outward (toward the perianth). *Irids*.....IRIDACEÆ. 149*
155 Petals and sepals similarly colored. *Amaryllids*..AMARYLLIDACEÆ. 147*
155 Petals and sepals unlike in color. *S. Long Moss*.....BROMELIACEÆ. 146
156 Petals and sepals similarly colored....157
156 Petals and sepals dissimilarly colored....162
157 Styles or sessile stigmas united into 1....159
157 Styles and stigmas 3, distinct....158
158 Fruit a berry. Leaves net-veined, petiolate. *Green briers*...SMILACEÆ. 151
158 Fruit a pod, 00-seeded. Lvs. parallel-v'ned. *Melanths.* MELANTHACEÆ. 155*
158 Fruit splitting into 1—2-seeded parts. Lvs. rush-like...ALISMACEÆ. 138*
159 Perianth colored, succulent and withering....160.
159 Perianth green, dry, or if colored, scarious. *Rushworts*...JUNCACEÆ. 156
160 Flowers regular, hexandrous....161
160 Fls. irr., or triandrous. Water plants. *Pickerel Weeds*..PONTEDRIACEÆ. 154
161 Perianth woolly or scurfy outside, tubular........HÆMODORACEÆ. 148
161 Perianths smooth outside, mostly 6-parted. *Lilies*......LILIACEÆ. 153*
162 Styles or stigmas 3. Leaves net-veined. *Trilliads*.....TRILLIACEÆ. 152*
162 Style and stig. 1. Lvs. parallel-veined. *Spiderworts*..COMMELYNACEÆ. 157
162 Styles many. Leaves somewhat net-veined.............ALISMACEÆ. 138*
163 Plants terrestrial....164
163 Plants growing in water....165

164 Spadix with a spathe, or on a leaf-like scape. *Arads*......ARÀCEÆ. 134*
164 Spadix ? with no spathe and not on a scape. *Typhads*...TYPHÀCEÆ. 136
165 Rt. floating in water. Plant on the surface. *Duckmeats*..LEMNACEÆ. 135
165 Root fixed in the mud. Plants submersed. *Naiads*....NAIDACEÆ. 137
166 Petals conspicuous, yellow. *Xyrids.—Xyris*..........XYRIDACEÆ. 158
166 Pet. inconspicuous, white. *Pipeworts.—Eriocaulon.* ERIOCAULONACEÆ. 159

Orders of the Glumaceous Endogens.

167 Stems mostly solid. Sheaths of the lvs. entire. *Sedges*...CYPERACEÆ. 160
167 St. mostly hollow. Sheaths split to the joints. *Grasses*....GRAMÍNEÆ. 161

THE FLORA:

OR, SELECTIONS FROM THE NATIVE AND CULTIVATED

PLANTS OF THE UNITED STATES.

DESIGNED AS FIRST EXERCISES IN ANALYTICAL BOTANY.

EXPLANATIONS. The Tables in this work are designed to be *complete;* that is, each Ordinal Table includes *all* the Genera belonging to that Order known in the United States, east of the Mississippi River; and each Generic table includes, in like manner, *all* its known species. The numbers annexed to the Genera in the Ordinal Tables refer to the descriptions, immediately following. If no number be annexed, the pupil will understand that that Genus is not further noticed.

CHAPTER I.

OF THE POLYPETALOUS EXOGENS.

Essential Character.—Flowering plants (PHÆNOGAMIA) with their stems growing by additions to the outside in layers (EXOGENS), their seeds enclosed in a seed-vessel or pericarp (ANGIOSPERMS), their flowers with a double perianth, and their petals distinct (POLYPETALÆ). (But to this last condition there are some exceptions.)

ORDER I. RANUNCULACEÆ—CROWFOOTS.

Herbs, rarely *shrubs*, with a colorless, acrid juice, with
leaves mostly alternate and much divided, without stipules,
sepals 3—15, deciduous, distinct, and colored when apetalous,
petals 3—15, distinct, often deformed or contracted, or wanting,
stamens 00, distinct, hypogynous—ovaries 00 (rarely 1 or few), distinct,
fruit either achenia, or follicles, or berries, and the seeds with a minute embryo at the end of fleshy albumen.

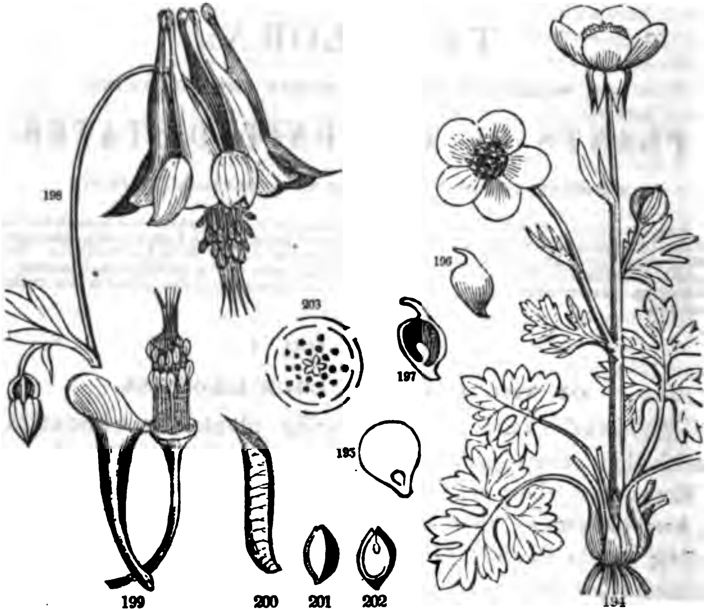


Fig. 194. Ranunculus bulbosus. 195, a petal, showing the honey scale at base. 196, a single ovary. 197, section of it, showing the ovule. 198, **Aquilegia Canadensis.** 199, one of the hollow petals attached to the receptacle with the stamens and styles. 200, a ripe follicle. 201, a seed; 202, section of it, showing the embryo. 203, plan of the flower.

ANALYSIS OF THE GENERA GROWING IN THE U. STATES.

1 Leaves opposite....2
1 Leaves alternate....3
2 Sepals valvate (§ 346) in the bud. *Virgin's Bower*...... *Genus* CLEM'ATIS. 1
2 Sepals imbricate (§ 349) in the bud. *Wind-flower*............ ANEMO'NE. 2
3 Flowers regular....5
3 Flowers irregular....4
4 Upper sep. hooded, covering the 2 deformed pet. *Monk's-hood*... ACONI'TUM. 3
4 Upper sepal and petals spurred behind. *Larkspur*.......... DELPHIN'IUM. 4

5 Sepals green.....6
5 Sepals colored and petal-like....9
6 Leaves all radical....7
6 Leaves radical and cauline....8
7 Leaves 3-lobed. *Noble Liverwort*..........................Hepat'ica. 5
7 Leaves linear. Plant very small. *Mouse-tail*.............Myosu'rus.
8 Styles many, achenia in fruit. Sepals deciduous. *Crowfoot.* Ranun'culus. 6
8 Styles 2—5, pods, or follicles in fruit. Sepals persistent. *Piny*....Pæo'nia.
9 Petals none....10
9 Petals present....13
10 Fruit several follicles....11
10 Fruit many achenia....12
10 Fruit a red, compound berry. *Orange-root*................Hydras'tis.
11 Flowers yellow, leaves reniform. *Marsh Marigold.* ....Caltha. 7
11 Flowers white, leaves compound..........................Isopy'rum.
12 Leaves palmately lobed, large. Stem tall. Prairies, *W.* Trautvette'ria.
12 Leaves twice or thrice ternate. *Meadow Rue.* ....Thalic'trum.
13 Stem shrubby, short. Fls. dark purp. *Yellow-Root*.....Zanthorhi'za.
13 Stems herbaceous....14
14 Ovaries and fruit pod-like, several seeded....15
14 Ovaries and fruit seed-like (achenia). Fls. crimson...........Ado'nis. 8
14 Ovary single and simple, in fruit a berry. *Cohosh*..............Actæ'a.
15 Petals very small, 1-lipped, tubular at base. *Globe-flower*...Trol'lius.
15 Petals small, 1-lipped, tubular at the top. *Gold-thread*.......Cop'tis. 9
15 Petals quite small, 2-lipped, tubular. *Hellebore*.........Helleb'orus.
15 Petals larger than the sepals, spurred behind. *Columbine*..Aquile'gia. 10
15 Petals small, stamen-like, flat, 2-horned at top. *Bugbane*..Cimicif'uga.
15 Petals common size, flat, 3-lobed. *Fennel-flower*.............Nigel'la.

1 CLEM'ATIS. Virgin's Bower.

Calyx of 4 (rarely 5, 6 or 8) sepals, colored, pubescent. Corolla 0, or small and stamen-like. Filaments 00, shorter than the sepals. Ovaries 4—20. Styles becoming long and feathery upon the seed-like achenia.—♃ Mostly climbing vines, with twisting petioles for tendrils, and with compound, opposite leaves.

1 Petals none, the sepals colored like petals....2
1 Petals several, slender. Sepals large, purplish. Stem climbing, with ternate leaves in whorls of 4s. *E. N-E*...C. Verticilla'ris.
2 Stem erect, simple, with one terminal, nodding, large flower....3
2 Stem climbing by the petioles, with several flowers....4
3 Leaves undivided, ovate, entire, silky beneath. *S. M*.....C. ochroleu'ca.
3 Leaves undivided, broad-ovate, smooth, glaucous beneath. *S*..C. ova'ta.
3 Leaves 3-cleft into linear lobes, or lance-ovate, entire. *S*....C. Baldwin'ii.
4 Flowers solitary, large, purple. Leaves mostly pinnate....6
4 Flowers in panicles, rather small, white. Leaves ternate....5
5 Leaflets smooth, ovate, cut-toothed. Stem 10—16f long. *c*...C. Virginia'na.
5 Leaflets downy, lance-oblong, entire. *S. Rare*..........C. holoseri'cea.
6 Sep. thick, not wavy, point narrow, reflexed. *M.S. W. Leather-fl.* C. Vior'na.
6 Sepals thickish, not wavy. Lfts. 9, oval, obtuse, veiny. *S.* C. reticula'ta.
6 Sepals thickish, wavy at edge. Fls. long-bell-shaped. *S.* C. cylin'drica.
6 Sepals thin, wavy and crisped. Fruit tails not feathery. *S*......C. crispa.

2. ANEMO'NE. Wind-flower.

Calyx regular, of 5—15 colored sepals. Petals none. Stamens 00, much shorter than the sepals. Ovaries 00, collected into a roundish or oblong head. Achenia generally without tails.—♃ Leaves mostly radical, palmately divided, those of the stem opposite in whorls of 3, forming a sort of involucre.

1 Carpels without tails in fruit....2
1 Carpels with long feathery tails. Lvs. cleft into lance-linear lobes, with long, soft hairs. *Mar. Ap. N-W. Rare. (Pasque-fl.)* A. patens.
2 Stem leaves (involucre) sessile. Fls. white or blush white....3
2 Stem leaves petiolate....4
3 Flower 1 only, with 15—20 sepals. Hight 4'—12'. *S*....A. Caroliniа'na.
3 Fls. 1—5, with 5 obovate sepals. Hight 12'—20'. *N-W.* A. Pennsylvan'ica.
4 Flower-stalks 1 or several, all leafless....5
4 Flower-stalks 2—5, all (except the oldest one) 2-leaved in the middle....6
5 Flower 1, its stalk 2' or 3' long. Sep. blush-white. *Apr. c*....A. nemoro'sa.
5 Fls. mostly several, whitish, on stalks 6'—12' long. *N.M.W.* A. cylin'drica.
6 Leaf-lobes lance-ovate. Flowers whitish. Ht. 2—3f. *Can*.....A. Virginia'na.
6 Leaf-lobes linear. Flowers red. Ht. 6'—12'. *N. Rare*......A. Hudsonia'na.

3. ACONI'TUM. Monk's-hood.

Sepals 5, irregular, colored, upper one vaulted or hooded. Petals 5 or 6, the two upper on long claws, concealed beneath the upper sepal, recurved and honeyed at top; the other 3 or 4 very small.

Styles 3—5. Follicles 3—5.—♃ Leaves palmately cleft or divided. Flowers odd and showy, in terminal spikes.

Stem weak, reclining, widely branched. Helmet conical. *M.S.* A. UNCINA'TUM.
Stem stout, erect, nearly simple. Helmet semi-circular. *Cult.*† A. NAPEL'LUS.

4. DELPHIN'IUM. LARK-SPUR.

Sepals 5, colored, the upper one spurred. Petals very irregular, the two upper ones extended behind into a tubular, honeyed spur, sheathed in the spur of the calyx. Styles 1—5. Follicles 1—5.—Showy herbs with the leaves much divided. Flowers blue, red, or purple, never yellow.

1 Species found wild in the country, often also in gardens....2
1 Species never wild in this country, but found in gardens (omitted).
2 Ovaries and pods 3—5. Petals separate. ♃....3
2 Ovary and pod 1 only. Pet. united. Lvs. finely divided. ①..D. CONSOL'IDA.
3 Racemes long and slender, many-flowered....4
3 Racemes loose, few (6—12)-flowered....5
4 Leaf-lobes wedge-form. Flowers bright blue. *N. M. W.* ... D. EXALTA'TUM.
4 Leaf-lobes linear. Spur ascending. Flowers azure. *S.*......D. AZU'REUM
5 Leaf-lobes linear. Spur straight. Pods wide-spread. *M. W.* D. TRICOR'NE.
5 Leaf-lobes lanceolate. Spur ascending. Fls. greenish. *S.*...D. VIRES'CENS.

5. HEPAT'ICA. NOBLE LIVERWORT.

Calyx (generally called an involucre) of 3 entire, ovate, green sepals (or bracts), situated a very little below the corolla. Corolla of 5—9 petals, arranged in 2 or 3 rows. Achenia without tails.—♃ Pretty little plants blossoming in early spring. Leaves all radical, thick, 3-lobed, green through the winter. Flowers numerous, one on each scape, blue, roseate, or white.

Leaf-lobes and sepals obtuse. Scapes hairy, several inches high. H. TRIL'OBA.
Leaf-lobes and sepals acute. Fls. and scapes like the other.... H. ACUTIL'OBA.

6. RANUN'CULUS. CROWFOOT. BUTTER-CUPS.

Calyx of 5 ovate sepals. Corolla of 5 roundish, shining petals, each with a honeyed scale or pore at the base inside. Stamens 00. Achenia numerous, flattened, crowded in a roundish or oblong

head.—A large genus of herbs, mostly ♃ and with yellow flowers. Leaves divided or entire. Juice very acrid.

1 Petals yellow. Seeds (carpels) roughened with prickles. Fls. small. *S*...11
1 Petals yellow. Seeds smooth and even. *N. & S.*....2
1 Petals white (claws yellow). Seeds wrinkled crosswise....2
2 Leaves all undivided. Plants growing in wet places....6
2 Leaves more or less divided, not growing under water....3
2 Leaves in fine, numerous, thread-like divisions, growing under water....5
3 *Root* leaves neither divided nor cleft, merely crenate,...7
3 Lower leaves 3-cleft, but not (divided) to the base. Hight 1—2f.....8
3 Leaves all ternately divided, and much cleft....4
4 Sepals reflexed in flower. Plants erect....9
4 Sepals spreading in flower, shorter than the petals....10
5 In ponds and rivers. The (white) pet. with a cavity at base. R. AQUAT'ILIS.
5 In stagnant waters. The (yellow) petals with a scale at base. R. PUR'SHII.
6 Stems ascending (1—2f). Lvs. all lanceolate, narrow, entire..R. FLAM'MULA.
6 Stems nearly erect (6′—12′). Lower leaves round-ovate.......R. PUSIL'LUS.
6 Stems creeping and rooting (4′—8′). Leaves lance-linear.......R. REPTANS.
6 Stems creeping and rooting (1f). Lvs. all round-cordate....R. CYMBALA'RIA.
7 Pl. hairy, bushy (4′—10′). Root leaves rhomb-ovate. *W*...R. RHOMBOIDE'US.
7 Plant glabrous (1—2f). Root leaves round-cordate· *N. W*....R. ABORTI'VUS.
8 Stem hairy. Seeds with a straight beak, in a round head. *S.* R. PALMA'TUS.
8 Stem hairy. Seeds with a recurved beak, in a round head. R. RECURVA'TUS.
8 Stem glabrous. Seeds not beaked, in a cylindrical head....R. SCELERA'TUS.
Erect (6′—12′) from a solid bulb. Pet. large. Hd. of fr. round. R. BULBO'SUS.
9 Erect (1—3f), very hairy. Head of fruit oblong.........R. PENNSYLVAN'ICUS.
10 Stems both creeping and ascending. Peduncles furrowed......R. REPENS.
10 St. ascend. 4′—12′. Root fasciculate. Lvs. appear pinnate. R. FASCICULA'RIS.
10 St. erect, tall (2—3f). Leaf divisions all sessile. *Very com. N. M.*..R. ACRIS.
11 Sep. shorter than the pet., spread. Lvs. 3-lobed & cleft. *S.* R. MURICA'TUS.
11 Sep. long as pet., finally reflexed. Lvs. 3-lob. & cleft. *S.* R. PARVIFLO'RUS.

7. CAL'THA. MARSH MARIGOLD.

Calyx colored, of 5 roundish sepals resembling petals. Corolla 0. Stamens 00. Follicles 5—10, oblong, compressed, erect, many-seeded.—♃ Smooth marsh plants.

C. PALUS'TRIS. (*Cowslips. Marsh Marigold.*) In wet meadows. Root large, thick. Stem about 1f high, hollow, round, branched. Leaves large (4—6′ wide), roundish, cordate, crenate, lower on long, half-round petioles, upper sessile, all of a dark, shining green, and very smooth. Flowers of a golden yellow in all their parts, 1½′ broad. Outer row of stamens club-shaped, long. *Apr. May.*

8. ADO'NIS. PHEASANT'S-EYE.

Sepals 5, colored. Petals 5—15, with no scale on the claws. Achenia in a spike, egg-shaped, and pointed with the hardened, persistent style.—Leaves numerously cleft into linear and very narrow segments. Flowers terminal, solitary, red or yellow.

A. AUTUMNÀLIS. A fine, hard annual, from Europe, cultivated in gardens, and naturalized in some places. Stem rather thick for its hight, branched. Leaves pinnately parted, with very numerous segments. Petals 5—8, of a bright crimson color, 1½′ across.

9. COP'TIS. GOLD-THREAD.

Calyx of 5 or 6 oblong, colored sepals. Corolla of 5 or 6 small, club-shaped sepals, hollow and 1-lipped at top. Stamens 20—25. Follicles 5—10, stalked, beaked, spreading, 4—6-seeded.—♃ Herbs with radical leaves and long, creeping root-stocks.

C. TRIFOLIA (*Gold-thread*). Leaves 3-foliate, all radical, the divisions broad, 4—8″ long, crenate, smooth shining, sessile. Petiole 1—2′ long. Stems under ground, creeping extensively, bright yellow, and very bitter. Peduncles 3—4′ high, each 1-flowered. Calyx white. Petals yellow, much smaller than the sepals, barely distinguishable among the stamens by their color. *May. Mid. North.*

10. AQUILE'GIA. COLUMBINE.

Sepals 5, ovate, colored, spreading. Petals 5, tubular with a wide mouth, the outer margin erect, the inner attached to the receptacle, and behind extended into a long, spurred nectary. Stamens 30—40, the inner ones longer and sterile. Styles 5. Follicles 5, many-seeded.—♃ Leaves twice and thrice ternate. Flowers nodding.

Spurs straight, longer than limb. Sta. exserted. Fls. scarlet. C. CANADÉNSIS.
Spurs incurved, shorter than limb. Sta. included. Fls. purple.† C. VULGÀRIS.

ORDER 2. MAGNOLIA'CEÆ.—MAGNOLIADS.

Trees and *shrubs* with membranous stipules sheathing the buds, with *leaves* alternate, leathery, simple entire or lobed, never serrate, *flowers* solitary, large and showy, mostly odorous and perfect, *sepals* 3—6, colored like the 6—12 hypogynous imbricated petals, *stamens* numerous, hypogynous, distinct, and many ovaries, *fruit* compound, composed of the united carpels, and with the *embryo* minute in the end of fleshy albumen.

ANALYSIS OF THE GENERA.

1 Carpels arranged in a cone....2
1 Carpels whorled in a single row. *S*................ .... Illicum.
2 Anthers opening inward..................................Magnolia. 1
2 Anthers opening outward .... Liriodendron. 2

1. MAGNO'LIA.

Sepals 3. Petals 6—9. Anthers longer than the filaments, opening inward. Carpels 2-valved, 1—2-seeded, imbricated into a hard, cone-like fruit. Seeds berry-like, suspended when ripe by a long seed-stalk.—A noble genus of trees or shrubs, with large, fragrant flowers.

1 Leaves acute at the base (not cordate)....2
1 Leaves cordate or auriculate at the base. Trees 30—40f high....5
2 Leaves shining above, white or rust colored beneath. Petals 9—12....3
2 Leaves dull green both sides, thin, deciduous. Petals 6—9....4
3 Tree evergreen, 60—70f high. Fls. 7′—8′ broad. *S*..... M. grandiflora.
3 Shrub decid. (at the N.), 6—20f high. Fls. 2′—3′ broad. *N. S.* M. glau'ca.
4 Tree small. Fls. and lvs. large, ends of branches whorled. *M. S.* M. umbrélla.
4 Tree large. Fls. small (3′—4′ broad). Lvs. scattered. *M.S.* M. acuminàta.
5 Petals yellow (6—9), with reddish lines. Fls. 5′ broad. *S.* M. cordàta.
5 Petals white (9). Leaves ear-shaped at base. *S*..............M. Frasèri.
5 Petals white (6), a purple spot inside. Fls. 9′ broad. M. macrophyl'la.

2. LIRIODENDRON.

Sepals 3. Petals 6, in two rows. Anthers opening outward. Carpels 1—2-seeded, imbricated into a cone, indehiscent, separating from each other in fruit.—Trees with large and fragrant flowers.

L. TULIPIFERA. (*Tulip tree. Whitewood. Poplar.*) This is one of the finest and largest trees of our forests. The trunk is generally straight and cylindric, dividing at the top rather abruptly in a few coarse and crooked branches. Leaves dark green, smooth, square at the end, with 2 lobes each side, 3—5′ in length and breadth. Flowers large and brilliant, greenish yellow, orange within, 4—6′ broad. *May. June.*

ORDER 6. BERBERIDACEÆ.—BERBERIDS.

Herbs and *shrubs*, with alternate leaves and perfect flowers, with
sepals imbricated in the bud in 2 or more rows,
petals opposite the sepals, also imbricated in two or more rows,
stamens opposite to the petals, having the anthers opening by 2 lids;
ovary 1-celled, solitary and simple, forming a capsule or berry.

ANALYSIS OF THE GENERA.

Herbs with 12—18 stamens.	*May Apple*	PODOPHYLLUM. 1
Herbs with 8 stamens.	*Twin-leaf. Rheumatism-root.*	JEFFERSONIA.
Herbs with 6 stamens.	*Cohosh. Pappoose-root.*	LEONTICE.
Shrubs with yellow flowers and acid berries.		BERBERIS. 2

1. PODOPHYLLUM. MANDRAKE.

Sepals caducous. Petals 6—9, obovate, concave. Stamens 12—18, with linear anthers, the lids scarcely opening. Berry large, egg-shaped, 1-celled, crowned with the solitary stigma.—Low, somewhat poisonous herbs, with one or two leaves and one flower.

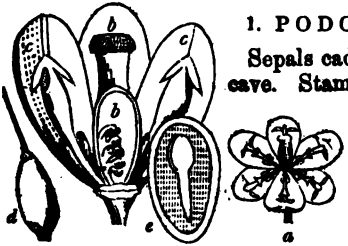


Fig. 204.—*a*, Flower of Berberis vulgaris; *b*, the pistil (magnified) with the ovary cut open; *c*, *c*, petals with stamens opposite; *d*, a berry; *e*, a seed cut open, showing the embryo.

P. Peltàtum. (*May Apple. Wild Mandrake.*) A singular and interesting plant, in woods and fields. Hight about 1f. The barren plants bear but a single leaf, which is 5—8′ broad, 5—7-lobed, and centrally peltate. The flowering plants have a pair of leaves, with the flower at the fork of the two petioles—the leaves not peltate, but with a deeply hollowed base, about 7-lobed. Flower drooping, white, about 2′ across. Fruit yellowish, with the flavor of the Strawberry. *May.*

2. BER′BERIS.

Sepals 6, obovate, colored, the 3 outer ones smaller. Petals 6, roundish, with two glands at the base of each, inside. Stamens 6. Stigma sessile, disk-like, on the top of the ovary. Berry oblong, sour, 1-celled, 2—3-seeded.—Fine, hardy shrubs, with the wood, inner bark, and flowers yellow.

B. Vulgàris. (*Common Berberry bush.*) A well-known, bushy, handsome shrub, in hard soils. Grows 3—8f high. Leaves oval, near 2′ long, rounded-obtuse at apex, tapering to a petiole, with bristly serratures on the margin. Flowers yellow, a dozen or more in each hanging raceme, with entire petals. Stamens irritable, springing against the stigma when touched. Berries red, very sour. *June.*

Order 8. NELUMBIA′CEÆ.—Nelumbo.

Herbs aquatic, prostrate root-stock and radical, peltate leaves, with *flowers* large, solitary, on long, upright scapes, 4 or 5-sepaled, *petals* numerous, arranged in many rows, as are also the many stamens, *ovaries* separate, each with a simple style and stigma, becoming in *fruit* 1-seeded nuts, half sunk in the hollows of the very large torus, the *seeds* with a very large embryo and no albumen.

NELUM′BIUM.—Nelumbo.

The character of the genus the same as that of the order.

N. Luteum. (*Yellow Nelumbo.*) A magnificent flowering plant, frequent in the stagnant waters of the South and West, rare in N. Y. and Conn. The leaves are 1—2f broad, round, entire, peltate in the centre which is concave, and elevated above the water more or less on the long petioles. Flowers several times larger than the White Water Lily, but without fragrance. Petals concave, of a brilliant white at edge, becoming yellow toward the base. Nuts about as large as acorns, eatable. *June. July.* (See Frontispiece, Fig. 1.)

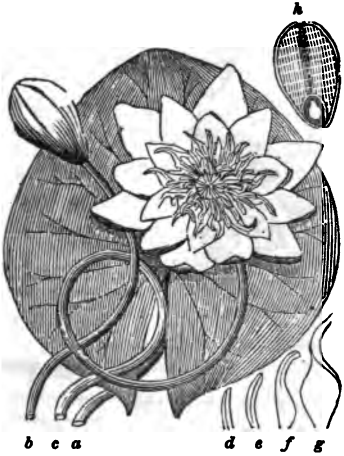
ORDER 9. NYMPHÆA'CEÆ.—WATER LILIES.

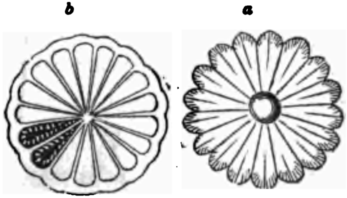
Herbs aquatic, with roundish leaves from a prostrate rhizoma. *Flowers* large and showy, the sepals, petals, and stamens gradually passing into each other, imbricated and arranged in many rows. *Sepals* few, colored inside, persistent. *Stigmas* radiating and crowning the *ovary* which in fruit becomes a capsule compound and 5-celled. *Seeds* minute, numerous, with the embryo at the end of the albumen.

ANALYSIS OF THE GENERA.

Petals large as the sepals, white, red, or blue .... NYMPHÆ'A. 1
Petals smaller than the sepals, stamen-like, yellow............NUPHAR.

1. NYMPHÆ'A.





206, *a*, the many-rayed stigma. *b*, cross section of the many-celled ovary.

Sepals 4 or 5, green outside. Petals 00, in many rows inserted on the receptacle beneath the ovary. Stamens 00, inserted above the petals. Anthers slender, opening inward, the outer filaments gradually widening and passing into petals. Capsule ripening under water.

Fig. 205, Nymphæa odorata. *a*, the leaf; *c*, the flower; *b*, the bud; *d*, *e*, *f*, *g*, stamens, gradually changing into petals; *h*, a seed cut open, showing the embryo in a little sack.

N. Odoràta. (*White Water Lily.*) One of the loveliest of flowers, frequent, in ponds and sluggish streams. The root-stock is long and thick, running in the mud where the water is from 3 to 10f deep, sending up leaves and flowers to the surface. Leaves 5—6′ long, roundish, cleft at the base to the centre, where the long petiole is inserted, margin entire. Petals lanceolate, 1½—2′ long, of the most delicate texture and whiteness, often tinged with purple. Filaments yellow. *July*.

Order 10. SARRACENIA'CEÆ.—Water Pitchers.

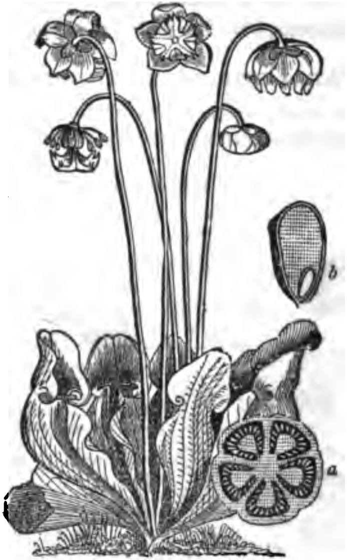


Fig. 207. Sarracenia purpurea, with bud, flowers, and fruit. *a*, the fruit (pod) cut open crosswise; *b*, a seed cut open, showing the embryo.

Herbs aquatic, in bogs, with fibrous roots, and with the *leaves* all radical, urn-shaped, hollow, and large flowers on scapes. *Sepals* 5, with 3 little bracts at base. *Petals* 5, clawed, bending inward

Stamens 00, hypogynous. *Ovary* 5-celled, with a single style, and the *stigma* very broad, peltate and 5-angled crowning, in fruit, the *capsule*, which is 5-celled and full of minute, albuminous seeds.

SARRACE'NIA. PITCHER-PLANT.

Character essentially as expressed in the Order.

1 Leaves short (4'—10'), pitcher-shaped, with a broad wing....3
1 Leaves long (12'—36'), trumpet-shaped, with a linear wing....2
2 Flowers purple. Lvs. straight, gradually enlarged upward. *S*....5
2 Flowers yellow. *S*....6
3 Leaf tube open, the hood open and erect. Fls. 2' broad....4
3 Leaf tube nearly closed by the arched, incurved hood. *S*......S. PSITICÌNA.
4 Fls. dark purple. Lvs. all similarly inflated, purple-veined. *Jn*. S. PURPU'REA.
4 Fls. yellow. Whole plant pale. Outer lvs. slender. *N. r. Jn*. S. HETEROPHYL'LA.
5 Lvs. 12'—18' long. Flowers 1½' broad, reddish purple. *S. May*. S. RUBRA.
5 Lvs. 18'—36' long. Fls. 2½' broad, deep purple, *S-E. Apr*. S. DRUMMÓNDII.
6 Leaves 12'—18' long, spotted with white, wing lance-linear. *Apr*...S. VARIÓLA.
6 Leaves 18'—36' long, almost wingless. Flowers very large. *Apr*...S. FLAVA.

ORDER 11. PAPAVERA'CEÆ.—POPPYWORTS.

Herbs, generally with a colored juice, with alternate leaves.

Flowers, on long peduncles, solitary, never blue. *Sepals* 2 or 3, deciduous.

Petals, generally 4, sometimes 8. *Stamens* 4, 8, 12, 16, or 20, &c.

Stigmas 2, or if more, star-like on the flat apex of the compound ovary.

Fruit, a pod-shaped or roundish capsule. *Seeds*, numerous and minute.

ANALYSIS OF THE GENERA.

1 Plants with a yellow juice....2
1 Plants with a bright red juice. *Bloodroot*................SANGUINÀRIA. 1
1 Plants with a milk-white juice. *Poppy*....................PAPÀVER. 2
1 Plants with a colorless juice. Gardens...............ESCHSCHÓLTZIA.
2 Capsule short, oblong, style scarcely any, stig. concave ......ARGEMÒNE
2 Capsule short, ovoid. Style manifest. Stigma convex......MECONÓPSIS.
2 Capsule long, slender, smooth. Fls. small. *Celandine*....CHELIDÒNIUM.
2 Capsule long, slender, rough. Flowers large...............GLAU'CIUM

1. SANGUINA'RIA. BLOOD-ROOT.

Sepals 2, caducous. Petals 8—12, the outer longer. Stamens about 24. Stigma sessile, 1 or 2-lobed. Capsule pod-like, oblong, 1-celled, 2-valved, acute at each end, and many-seeded.—♃ A low, acaulescent plant, with white flowers, and full of a red or orange-colored juice.

S. CANADÉNSIS, (*Blood-root.*) An interesting plant, in shady, rich soils, flowering in early spring. Rhizoma thick, fleshy, and when broken or wounded exudes a blood-colored juice, as does every other part. From each joint of the root-stock springs a single, large glaucous leaf, and a scape about 6′ high, bearing a single flower. Leaf kidney-shaped, with lobes separated by rounded sinuses between. Flower of a square outline, white, scentless, and of short duration.

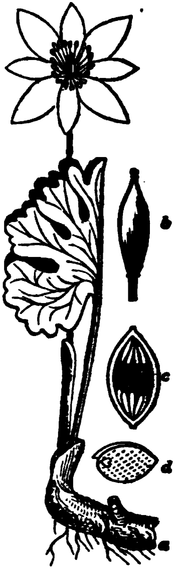


Fig. 208, Sanguinaria Canadensis. *b*, the pod; *c*, cross section of it; *d*, seed cut open, showing the embryo.

2. PAPA'VER. POPPY.

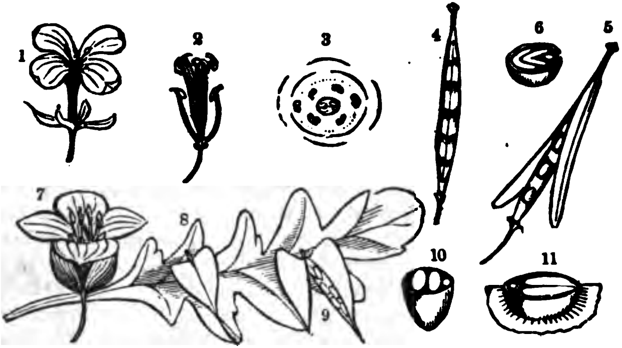
Sepals 2, caducous. Petals 4. Stamens 00. Stigmas many, united into a star-like crown, sessile upon the thick ovary. Capsule 1-celled, opening by pores beneath the edges of the stigma. Exotic herbs, mostly ②, with a milk-white juice abounding in opium.

1 Bristly or hairy. Leaves pinnatifid. Flowers scarlet....2
1 Smooth, glaucous. Lvs. cut-toothed, clasping. Pod globose. P. SOMNÍFERUM.
2 Pod club-shaped, smooth. Leaves coarsely divided.............P. DU'BIUM.
2 Pod globose, smooth. Leaves more finely divided..............P. RHÆAS.

ORDER 13. CRUCIF'ERÆ.—MUSTARDWORTS.

Herbs with alternate *leaves* and no stipules, and regular flowers, with *sepals* 4, and *petals* 4, spreading in the form of a cross, *stamens* 6, 2 of them on opposite sides shorter than the rest, an *ovary* of 2 united carpels, forming in fruit a *silique* or *silicle*, with 2 cells and few or many seeds. *Seeds* without albumen, the large *embryo* variously bent and folded.

⁂ Under this large Order, as under others, we present to our young readers a complete analysis, by which they may trace to its genus *any Mustard-wort* growing in the United States. But as the genera are so nearly alike, great care and close observation will be needful in avoiding mistakes. The plants for examination *must be in fruit* as well as in flower.



209. 1. Flower of Mustard (Sinapis nigra). 2, its stamens, 4 long and 2 short. 3, the plan of the flower. 4, a pod (silique); 5, open, showing the valves and partition. 6, cross section of a seed, showing how the cotyledons are folded. 7, flower of the Shepherd's Purse (Capsella), with a leaf. 8, a pod (silicle); 9, open. 10, cross section of a seed; 11, of a seed of Sickle pod (Arabis canadensis), winged, or margined.

ANALYSIS OF THE GENERA.

* *Garden plants cultivated for ornament or art.*

1 Fruit a silique or long pod (§ 363)....5
1 Fruit a silicle or short pod (§ 364)....2
2 Silicle 2-celled, with 2 or more seeds....3
2 Silicle 1-celled, with one seed only. *Woad*....................IsÀTIS.
3 Petals all equal....4
3 Petals unequal, the 2 outside ones larger. *Candy-tuft*..........IBÈRIS. 1
4 Some of the stamens toothed. Gardens. *Madwort*...........ALYS'SUM.
4 Stamens all toothless. Silicles very large and thin. *Satin-flower*..LUNÀRIA. 2
5 Seeds flat. Stigma rounded or head-shaped. *Wall-flower*..CHEIRÁNTHUS.
5 Seeds flat. Stigmas 2-horned, spreading. *Stock*..........MATTHÌOLA.
5 Seeds egg-shaped. Stigma with 2 converging lobes. *Rocket*..HÉSPERIS

** *Plants growing wild, or cultivated for food.*

{ Flowers yellow....8
1 Fruit a silique, 2-celled lengthwise { Flowers white, purple, &c....6
{ Flowers yellow...5
1 Fruit a silicle, 2-celled lengthwise { Flowers white, purple, &c.....2
1 Fruit a jointed pod, with the partitions crosswise....11
2 Silicle flattened or turgid, with a broad partition.....4
2 Silicle flattened contrary to the narrow partition.....3
3 Silicle triang., seeds several in each cell. *Shepherd's Purse*. CAPSÉLLA. 3
3 Silicle roundish, with one seed in each cell. *Pepper-Grass*..LEPÍDIUM. 4
3 Silicle double, with one seed in each lobe. *S*..............SENEBIÈRA. 5
4 Silicle flattened. Lvs. cauline or radical. *Whitlow grass*......DRABA. 6
4 Silicle turgid. Leaves cauline. *Horse Radish*............COCHLEÀRIA.
4 Silicle turgid. Leaves all radical. *r. Awlwort*...............SUBULÀRIA.
5 Silicle obovoid, i.e., inversely egg-shaped, turgid. *False Flax*. CAMELÌNA.
5 Silicle globose, turgid, membranous. South-western......VESICÀRIA.
5 Silicle oblong, turgid, and somewhat terete. *Cress*......NASTÚRTIUM.
6 Seeds arranged in two rows in each cell, not winged. *Cress*..NASTÚRTIUM.
6 Sds. arranged in two rows in each cell, winged on the margin. TÚRRITIS.
6 Seeds arranged in a single row in each cell....7
7 Sil. linear, flattish, each valve with 1 central vein. *Rock Cress*...A'RABIS. 7
7 Silique lanceolate, flat, the valves veinless. *Tooth root*....DENTÀRIA. 8
{ Sds. bordered. *False Rocket*...IODÀNTHUS.
7 Sil. linear, veinless, terete, { Seeds not bordered.........SISY'MBRIUM. 9
{ not raised on a stype......CARDAMÌNE. 10
7 Siliques linear, veinless, flat, { raised on a long stype. *S*.....WÀREA.
8 Seeds ovate or oblong....9
8 Seeds globose....10
8 Seeds flat, with a broad, winged margin. *S*...........LEAVENWÓRTHIA.
Sil. close-pressed to stem. Lvs. runcinate. *Hedge Mustard*..SISYM'BRIUM. 9
9 Siliques loose. Leaves lyrate. *Winter Cress*.............BARBÀREA. 11
9 Siliques loose. Leaves lanceolate. *False Wall-flower*....ERYS'IMUM. 12
10 Calyx spreading. Valves of the pod 1—3-veined. *Mustard*...SINÀPIS. 13
10 Cal. mostly erect. Valves of the pod 1-veined. *Cabbage, &c.*...BRÁSSICA.
11 Pods short, 2-jointed, with 1 seed in each joint. *Sea Rocket*....CAKÌLE.
11 Pods with several transverse joints and cells. *Radish*......RÁPHANUS.

1. IBE'RIS.—Candy-tuft.

The two outside petals larger than the two inside ones. Pods flattened, truncate, emarginate, the cells one-seeded.—Foreign, ornamental plants.

1 Flowers white. Plant about 1f high....2
1 Fls. purple, in umbels. Leaves serrate, upper entire......I. umbellàta.
2 Corymbs lengthening into racemes. Lvs. slightly toothed........I. amàra.
2 Corymbs scarcely lengthening. Leaves pinnatifid.............I. pinnàta.
2 Corymbs not lengthening. Shrubby. Lvs. linear, entire.....I. saxàtilis.

2. LUNA'RIA.—Satin-flower.

Sepals somewhat 2-lobed at base of the flower. Petals nearly entire. Stamens without teeth. Silicle oval or lanceolate, flat, usually very large, with a stalk. Seed stalk adhering to the partition. —Foreign, ornamental plants.

Pods lanceolate, narrowed to each end. Lvs. sharp-toothed. ♃. L. redivìva.
Pods broad-oval, rounded at each end. Lvs. blunt-toothed. ②..L. biénnis.

3. CAPSEL'LA.—Shepherd's Purse.

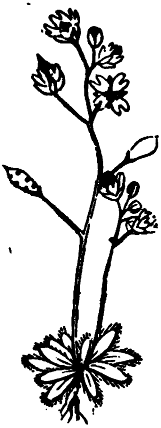
Calyx equal at base. Silicles triangular, wedge-shaped at base, notched at top, compressed laterally, that is, contrary to the narrow partition. Valves boat-shaped. Style short. Seeds 00, oblong, small.—A common weed, with white flowers.

C. **Bursa-Pastòris.** (*Shepherd's Purse*). Found every where, in fields, pastures, and road-sides. Stem growing to a foot in hight, hairy below, branching. Root-leaves many (when the plant has room), half a foot long, deeply-lobed and toothed. Stem-leaves much shorter, with two ear-shaped stem-clasping lobes at base. Flowers very small, in racemes which become very long, and are succeeded by the little purse-shaped pods. *Apr.—Sept.*

4. LEPID'IUM.—Pepper-grass.

Sepals ovate. Petals ovate, entire. Silicles roundish or oval, notched at the end, flattened contrary to the very narrow partition. Cells 1-seeded. Valves boat-shaped, dehiscent. Flowers white, racemed, numerous.

1 Stem-leaves undivided. Flowers from *June* to *Sept*....2
1 Leaves all divided and lobed. Pods round. Gardens. *July*. L. SATÌVUM
2 Pods round, wingless. Root-leaves pinnatifid, st.-lvs. toothed.. L. VIRGINICUM
2 Pods roundish-oval, wingless. Petals 0. Stem-lvs. entire. *W*.. L. RUDERÀLE
2 Pods ovate, winged, rough-scaly. Leaves arrow-shaped. *W*.. L. CAMPÉSTRE



210. Draba verna.

5. SENEBIE'RA.

Silicle 2-lobed, appearing double. Valve somewhat turgid and indehiscent. Cells each with 1 roundish and 3-cornered seed.—Flowers white, in short racemes which stand opposite to the leaves.

S. PINNATÍFIDA. A prostrate, weed-like plant, common at the South, in fields and on river-banks. Leaves divided in a pinnate manner, into oblong, toothed lobes. Flowers obscure, with scarcely any petals. Silicles flattened, notched at apex, wrinkled on the surface. *Feb.—July*.

6. DRA'BA.—WHITLOW-GRASS.

Calyx equal at base. Petals equal. Filaments without teeth. Silicle oval-oblong, entire, flattened parallel to the broad partition. Cells 2, many-seeded. Seeds not margined.—Low herbs, with small white or yellow flowers in racemes.

211. A pod open.

1 Petals undivided. Stems more or less leafy....2
1 Pet. 2-cleft. Lvs. small, all radical. Scapes 1′—6′ high. *Mar. Apr.* D. VERNA.
2 Pods of about the same length as their pedicels. *Apr. May*....3
2 Pods longer than their pedicels. *March—June*....4
2 Pods 3 times shorter than ped'ls, oval, in a long raceme. *N-W.* D. NEMORÀLIS.
3 Lvs. lanceo.,sharp-toothed. Pods lanceo., long-sty. *M. W. S.* D. RAMOSÍSSIMA.
3 Lvs. round-ovate,upper ones lnr. Pods oval, short-styled. *r.* D. BRACHYP'ODA.
4 Lvs. rnd-ovate, entire. Pds. lnr. in a sort of corymb. (1′—3′.) D. CAROLINIÀNA.
4 Lvs. lanceo., sharp-toothed. Pods lance-oblong, short-sty. (8′).. D. ARÀBISANS.
4 Lvs. wedge-obl. Pods lance-oblong, with no sty. (4′—8′). *W. S.* D. CUNEIFÒLIA.

7. AR'ABIS.—ROCK CRESS. SICKLE-POD.

Sepals erect. Petals clawed, entire. Silique linear, flattened.

valves one-veined in the middle. Seeds in a single row in each cell.—Flowers white.

1 Seeds winged with a broad margin. Pods curved, 3′ long....2
1 Seeds almost or quite marginless. Pods 1′—2′ long....3
2 Stem-lvs. narrowed to the base. Pods drooping. Smoothish..A. Canadénsis.
2 Stem-leaves arrow-shaped. Pods spreading. Plant very smooth. A. lævigàta.
3 Stem-lvs. half-clasping by the cordate or sagittate base....4
3 Stem-lvs. narrowed to the base. Root-lvs. lyrate, pinnatifid...A. lyràta.
4 Pods straight, very erect. Root-lvs. oblong-ovate, petiolate, hairy. A. hirsúta.
4 Pods straight, sprding. Rt.-lvs. obovate, obtuse, sharp-toothed. *W.* A. dentàta.
4 Pods spreading and curved upward. Lvs. coarsely toothed. *W.*..A. patens.

8. DENTA'RIA.—Tooth-root. Pepper-root.

Sepals converging or closed. Silique lanceolate, with flat, veinless valves opening elastically. Seeds in a single row in each cell, ovate, not bordered.—Plants ♃. Stem a prostrate, jointed rhizoma. Stem leaves but 2 or 3. Flowers white or purplish.

1 Stem-leaves almost opposite or whorled....2
1 Stem-leaves alternate or scattered. Root-stock moniliform....3
2 Stem-lvs. 2 only, leaflets 3, ovate, toothed. Root-stock toothed. D. diphyl'la.
2 St.-lvs. 3, leaflets 3—5, linear, cleft. Rt.-stock a string of tubers..D. laciniàta.
2 Stem-lvs. 2—3, numerously divided into linear leaflets. *S.*...D. multífida.
3 Leaflets 3, ovate, cut and cleft. Lvs. 3—7. Fls. purple. *M.*..D. máxima.
3 Lflts. 3, nearly entire; of the rt.-lvs. round-ovate, toothed. D. heterophyl'la.

9. SISYM'BRIUM.—Hedge Mustard.

Calyx erect (or spreading in some species), equal at base. Petals clawed, entire. Silique terete or somewhat 4-angled. Valves concave. Style very short. Seeds ovoid, in a single row.

Leaves runcinate. Pods close-pressed to the stem. Fls. yellow. *c*...S. officinàle.
Leaves oblong-obovate, a little toothed. Pods spreading. Fls. white. S. Thaliana.
Leaves twice pinnatifid, segments small. Pods wide-spread......S. canéscens.

10. CARDAMINE.—Bitter Cress.

Calyx a little spreading. Silique linear, with flat, veinless valves

which are narrower than the partition. Stigma entire. Seeds not margined, with a slender seed-stalk.—Flowers white.

C. HIRSUTA. (*Pennsylvanian Cardamine*). A variable plant with small, white flowers, common every where in wet places. The plant is generally smooth, about a foot high. Leaves pinnate or lyrate-pinnatifid, leaflets 2—5 pairs, entire mostly, those of the root-leaves oval-oblong, of the cauline linear-oblong, the terminal one 3-lobed. Pods about 1' long, 12—18-seeded. *June.*

11. BARBARE'A.—WINTER CRESS.

Sepals erect, nearly equal at base. Silique columnar, 2—4-cornered. Valves concave or keel-shaped by means of a strong central vein. Seeds in a single row.—Leaves lyrate-pinnatifid. Flowers yellow.

B. VULGARIS. (*Winter Cress.*) Common in old fields, also brook-sides. Whole plant glabrous. Stem 1—2f high, branching above. Leaves lyrate with the terminal lobe roundish, upper leaves obovate, pinnatifid at base, crenate, or repand dentate—all dark green, shining. Flowers showy, in racemes. Pods obscurely 4-cornered, slender, ¾' long, curved upward. *May. June.* ♃.

12. ERYS'IMUM.—FALSE WALL-FLOWER.

Calyx closed. Silique linear, 4-sided. Stigma capitate. **Seeds in a single row in each cell.**—Mostly ②. Flowers yellow.

Stem ascending. Fls. small. Pods spreading, 1' in length. *M.* E. CHEIRANTHOIDES.
Stem strictly erect. Fls. large (¾' broad). Pods 2—3' long. *W.* E. ARKANSÁNUM.

13. SINA'PIS.—MUSTARD.

Sepals spreading. Petals ovate, with straight claws. Silique nearly terete, valves 3-veined. Style short. Seeds in a single row, globular.—① or ②, with yellow flowers.

Upper lvs. lance-linear, entire. Pods 4-cornered, smooth. (*Black.*). . S. NIGRA.
All the lvs. repand-toothed. Pods torose, smooth. (*Field M.*) S. ARVÉNSIS.
All the lvs. lyrate-pinnatifid. Pods bristly, shorter than beak. (*White.*) S. ALBA.

ORDER XVI. POLYGALA'CEÆ.—MILKWORTS.

Plants without stipules, bearing very irregular *flowers*; *stamens* 4—8, diadelphous. *Anthers* opening at the top, 1-celled, *fruit* a flattened, 2-celled, 2-seeded capsule, free from the calyx.

POLYG'ALA.—MILKWORT.

Sepals 5, persistent, 2 of them (wings) wing-shaped and colored. Petals 3, the lower one boat-shaped, and often tipped with a crest. Stamens united by the filaments into a split sheath, or into 2 sets, cohering more or less with the claws of the petals. Fruit a small 2-celled, 2-seeded capsule, flattened on the sides and notched on the top. Seeds with an appendage at one end.—Low, bitter herbs (sometimes shrubs) with simple, entire leaves, sometimes bearing under-ground flowers.

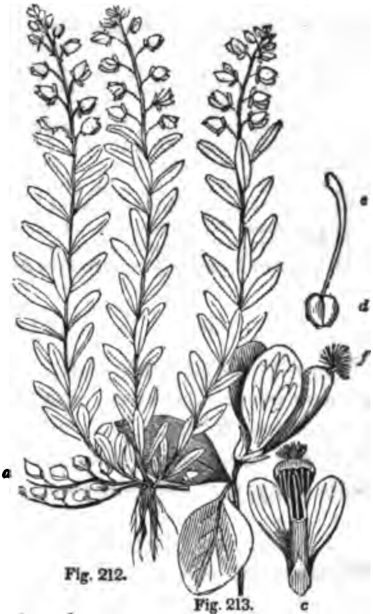


Fig. 212.

Fig. 213.

Fig. 212. Polygala polygama (Bitter Polygala): *a*, the radical flowers. 213. Polygala paucifolia, two leaves and a flower. *f*, the crest on the lower petal: *c*, the stamens in 2 sets and the style seen beneath the hooded lower petal: *d*, the ovary: *e*, the style.

1 Leaves all alternate and scattered....2
1 Leaves whorled, at least the lower ones, in 4s or 5s....9
2 Flowers in ovate or oblong, obtuse, thick spikes....3
2 Flowers few, or in racemes, or in a slender, acute spike....11
3 Flowers white, or reddish, or purple....4
3 Flowers yellow or yellowish green....8
4 Calyx wings as long as or longer than the petals....5
4 Calyx wings much shorter than the petals....7
5 Leaves linear and very narrow....6
5 Lvs. linear-oblong. Spikes obtuse, the broad wings imbricate. P. SANGUINÀRIA.
5 Lvs. lanceolate. Wings much longer than the petals. *S.*..P. BALDWÍNII.
6 Spikes rather loose, ⅓′ thick, bright purple, obtuse...........P. FASTIGIÀTA.
6 Spikes quite close, ¼′ thick, greenish purple, acutish.........P. NUTTÁLLII.
7 Lvs. linear-awl-shaped. Corolla with a showy crest. *S.W.*..P. INCARNÀTA.
7 Lvs. none, or merely short bristles. Corol. crested, tube short. *S.* P. SETÀCEA.

8 Spikes few, solitary, orange-yellow, ¾' thick, St. 1f high. *M.S.*....P. LUTEA.
8 Spikes few, solitary, yellowish-green, ¾' thick. St. 1'—4' high. *S.*..P. NÀNA.
8 Spikes in a compound cyme, straw-yellow. St. 1f high. *S.*...P. CYMÒSA.
9 Spikes slender, tapering, acute, long-stalked....10
9 Spikes oblong, obtuse, thick, sessile. Cal. wings acuminate..P. CRUCIÀTA.
9 Spikes oblong, obtuse, loose, stalked. Wings acute. *M.S.*..P. BREVIFÒLIA.
10 Lvs. linear, nearly all whorled. Fls. close. Wings round. P. VERTICILLÀTA.
10 Lvs. linear, the lowest whorled. Fls. scatter'd. Wings oval. *S.W.* P. AMBÍGUA.
10 Lvs. lance-obovate. St. 1—2f high. Wings round-obovate. *S.*...P. BOYKÍNII.
11 Flowers spiked, white. Leaves lanceolate. Stem 1f high......P. SÉNEGA.
11 Fls. racemed, purple, large. Lvs. lance-ovate. St. 1f. *S.*..P. GRANDIFLÒRA.
11 Fls. racemed, purple (radical fls. white). Lvs. linear-oblong. P. POLYGAMA.
11 Fls. 2 or 3, purple, large (radical fls. white). Lvs. ovate....P. PAUCIFÒLIA.

ORDER 17. VIOLA'CEÆ.—VIOLETS.

Herbs with simple (often cleft), alternate leaves with stipules. *Flowers* irregular, spurred, with the sepals, petals and stamens in 5s. *Cor.* spurred at base. *Anth.* united: 2 of the filaments appendaged. *Style* 1, with a one-sided stigma. *Capsule* 1-celled, 3-valved. *Seeds* many, with the embryo nearly as long as the albumen.

ANALYSIS OF THE GENERA.

Sepals unequal, with ear-shaped lobes at base......................VIOLA. 1
Sepals nearly equal, not appendaged at base ....SOLÈA.

1. VI'OLA.—VIOLET.

Sepals 5, prolonged at base into two auriculate lobes. Petals more or less unequal, the largest one spurred at base, the 2 opposite ones at the sides equal, the 2 upper ones all equal. Stamens cohering by their anthers, 2 of them spurred at base. Seeds attached to the valves of the capsule.—Low herbs, caulescent or acaulescent. Peduncles angular, solitary, 1-flowered, nodding at the top.

1 Species growing wild, in fields and woods....2
1 Species cultivated in gardens, not native....12
2 Acaulescent: Leaves and flowers all radical....3
2 Caulescent: stems leafy.....8

3 Flowers blue....5
3 Flowers white....4
3 Fls. yellow. Lvs. roundish-ovate, cordate. *N. M*..............V. ROTUNDIFÒLIA.
4 Lvs. reniform or roundish cordate. Petals beardless. *N. M*............V. BLÁNDA.
4 Leaves oblong or ovate, abrupt at base. Petals a little bearded.......V. PRIMULÆFÒLIA.
4 Leaves lanceolate, tapering into the petiole. Petals beardless.......V. LANCEOLÀTA.
5 Lvs. deeply 5—9-lobed and cleft....7
5 Leaves roundish, deeply cordate at base....6
5 Leaves lance-ovate, abrupt and often cut-toothed at base...........V. SAGITTÀTA.
6 Petals almost beardless. Spur very short. Mountains.............V. PALÚSTRIS.
6 Petals beardless. Spur as long as the petals. *N. M*.................V. SELKÍRKII.
6 Petals densely bearded. Spur short. Leaves rolled in at the base....V. CUCULLÀTA.
7 Petals beardless. Leaves with linear divisions.......................V. PEDÀTA.
7 Petals bearded. Leaves with linear divisions. *W*...........V. DELPHINIFÒLIA.
7 Petals bearded. Leaves with broad, angular divisions.............V. PALMÀTA.
8 Flowers white, purple, or blue....10
8 Flowers yellow. Stem leafy only at the top....9
8 Flowers cream-color. Stipules fringe-toothed. Spur short.............V. STRIÀTA.
9 Leaves very broadly cordate. Stipules large..................V. PUBÉSCENS.
9 Leaves hastate, acute. Stipules small. Spur short. *M. S*............V. HASTÀTA.
9 Leaves 3-parted. Lobes lanceolate, toothed. *S*................V. TRIPARTÌTA.

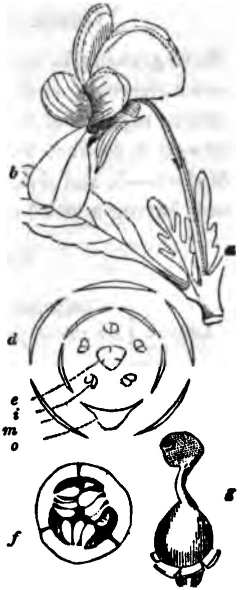


Fig. 214. Viola tricolor. *a*, the stipules; *b*, a leaf; *c*, a flower; *d*, the plan of the flower; *e*, the ovary in the centre; *i*, the row of stamens; *o*, the petals (lower one spurred); *m*, the sepals; *g*, the ovary with the style and stigma; *f*, cross section of the 3-celled ovary.

10 Spur longer than the petals. Fls. pale. *N. M. W*.........V. ROSTRÀTA.
10 Spur shorter than the petals....11
11 Stipules entire. Pet. whitish inside, purplish out ......V. CANADÉNSIS.
11 Stipules fringe-toothed. Leaves round-cordate......V. MUHLENBÉRGII.
11 Stipules lyrate-pinnatifid, very large. Pet. bluish-white...V. ARVÉNSIS.
12 Two of the petals purple, three yellow and white............V. TRÍCOLOR.
12 Petals colored alike, small, fragrant, stem roundish..........V. ODORÀTA.
12 Petals colored alike, large, violet purple. St. 3-cornered. V. GRANDIFLÒRA.

ORDER 18. DROSERA'CEÆ.—SUNDEWS.

Herbs growing in bogs, often covered with glands, with
leaves alternate, circinate (rolled from top to base) in the bud,
flowers regular, of 5 persistent sepals and 5 withering petals,
stamens 5, distinct and a single, compound *ovary*.
Styles 1—5, and *fruit* a 1—3-celled many-seeded capsule, and with
seeds having a small embryo at the base of the albumen.

ANALYSIS OF THE GENERA.

Leaves { coiled (circinate) in the bud. { Stamens 5..........DRÓSERA. 1
Leaves { coiled (circinate) in the bud. { Stamens 10—15.....DIONÆ'A. 2
Leaves { not coiled in the bud..........................PARNÁSSIA. 3

1. DROS'ERA. SUNDEW.

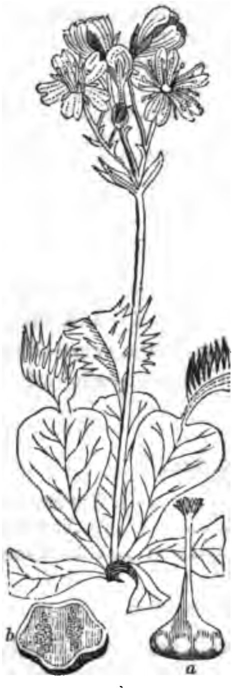
Sepals 5, united at base, persistent. Petals 5. Stamens 5. Styles 3—5, each deeply 2-parted, so that there seems to be 6—10. Capsule 3—5-valved, 1-celled, many-seeded.—♃ Small aquatic herbs. Leaves (all radical in the American species) clothed with long, reddish, gland-bearing hairs, exuding a clear, sticky fluid. Flowers in a raceme on a slender scape, which is at first coiled downward, but uncoils as the flowers open.

1 Flowers white, about ¼′ across....2
1 Flowers purple or rose-color, ½′ across....3
2 Leaves round, on long, hairy stalks, spreading. *Common*. D. ROTUNDIFÒLIA.
2 Leaves wedge-oblong, on long, smooth stalks, half-erect.....D. LONGIFÒLIA.
2 Leaves linear, obtuse, on slender, smooth stalks, erect. *N-W*...D. LINEÀRIS.
3 Lvs. broad-wedge-shaped, tufted, very short (½′). *S*.......D. BREVIFÒLIA.
3 Lvs. very long (6′—8′), thread-like, erect. Fls. showy. *E*. D. FILIFÓRMIS.

2. DIONÆ'A. VENUS' FLY-TRAP.

Sepals 5, spreading. Petals 5, obovate, with pellucid veins. Stamens 10—15. Style 1. Stigmas 5, many-cleft. Capsule breaking irregularly in opening, 1-celled, many-seeded.—♃ Glabrous herbs. Leaves all radical, sensitive, closing convulsively when touched. Scape umbelled.

D. Muscípula. A very remarkable plant, in sandy bogs, at the South, sometimes cultivated. Leaves spreading, the petiole broadly winged, ending in a roundish blade which is fringed with spines, instantly closing upon insects which alight upon it. Scape 6—12′ high, bearing an umbel of 8—10 white, handsome flowers. *Apr. May.*



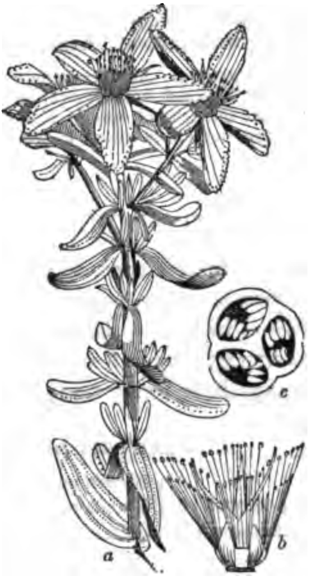


Fig. 216. Hypericum perforatum (Common St. John's-wort): *a*, stem, leaves and flowers; *b*, the stamens in 3 sets surrounding the ovary with 3 styles; *c*, cross section of the ovary.

Fig. 215. Dionæa muscipula, leaves, stem and flowers: *a*, the ovary with the style and stigmas; *b*, cross section of the ovary.

3. PARNAS'SIA. Grass-of-Parnassus.

Sepals 5. Petals 5, inserted on the calyx (perigynous). Stamens also perigynous, in 2 rows, the outer row of numerous sterile filaments, united in 5 sets, the inner row of 5 perfect stamens. Stigmas 4, sessile. Capsule 4-celled. Seeds very numerous—♃ Elegant herbs, with radical leaves and 1-flowered scapes.

1. P. Caroliniàna. An exceedingly interesting plant, in wet meadows, &c. Leaves about 7-veined, broadly oval or ovate, radical ones on long stalks, cauline few, near the ground, sessile, clasping. Scape about 1f high, bearing one flower at top, which is about 1′ across. Petals marked with green veins. *July. Aug.*

Order 20. HYPERICA'CEÆ.—St. John's-worts.

Herbs or *shrubs* with opposite, entire, dotted leaves, and no stipules. *Flowers* mostly yellow, in cymes. *Sepals* unequal, 4—5, dotted. *Petals* 4—5, twisted in the bud, dotted, and with the veins oblique. *Stamens* hypogynous, in 3 or more parcels. *Ovary* superior. *Style* 1. *Fruit* a capsule or berry, many-seeded.

ANALYSIS OF THE GENERA.

Petals and sepals 5.	Glands under the ovary 0.	Hypéricum. 1
	Glands under the ovary 3.	Elodèa.
Petals and sepals 4.	Glands under the ovary 0.	A'scyrum.

1. HYPER'ICUM. St. John's-wort.

Sepals 5, connected at base, nearly equal, leaf-like. Petals 5, oblique. Stamens many (sometimes few and distinct), united into 3—5 parcels with no glands between them. Styles 3—5, either distinct or united at base. Capsule 1-celled, or 3—5-celled.—Herbs or shrubs, with branching stems, opposite, entire leaves and yellow flowers.

1 Stamens 25—100, more or less united into clusters....2

1 Stamens 5—20, not at all united....12

2 Styles and cells of the capsule 5 or more....6

2 Styles 3 (often united into 1), capsule 3-celled or 3-valved....3

3 Capsule completely 3-celled....4

3 Capsule 1-celled with 3 prominent seed-lobes (placentæ, § 326)....5

4 Herbs with the flowers dotted with black....8

4 Shrubs with the flowers not dotted....7

5 Stems wholly shrubby. Styles united into 1....9

5 Stems shrubby at base only. Styles united into 1....10

5 Stems wholly herbaceous. Styles distinct at least at the top....11

6 Herb with large fls. (2′ broad). Lvs. lance-obl. Hight 3—4f H. PYRAMIDÀTUM.

6 Shrub with fls. 1′ broad. Lvs. lance-linear. Hight 1—2f. *M.N.* H. KALMIÀNUM.

7 Lvs. lance-oblong, obtusish. Shrub 2—4f. Fls. 1′ broad. *S-W.*H. PROLÍFICUM.

7 Lvs. lance-linear, appearing whorled. Fls. ½′ broad. *S.*....H. GALIOÌDES.

7 Lvs. linear, petiolate, rolled at edge. Fls. ½′ broad. *S-W.*H. ROSMARINIFÒLIUM.

7 Lvs. linear, sessile, narrow, edge revol. Fls. ½′ broad. *S.* H. FASCICULÀTUM.

8 St. 2-edged. Lvs. small, not black-dotted. Fls. 1′ wide. *Com.* H. PERFORÀTUM.

8 St. terete. Lvs. large, black-dotted. Sty. as long as ovary. *Com.*H. CORYMBÒSUM.

8 St. terete. All over black-dotted. Sty. twice as long as ovary. *S.*H. MACULÀTUM.

9 Fls. large (1½′ broad), solitary, sessile. Lvs. thick, sessile. *S.*..H. AUREUM.

9 Fls. in very leafy, compound cymes. Lvs. thick, clasping. *S.* H. MYRTIFÒLIUM.

9 Fls. in the axils of the upper leaves. Lvs. thin, acute. *S.*..H. AMBÍGUUM.

9 Fls. in leafless cymes. Lvs. thick, opaque, obtuse. *S.*....H. CISTIFÒLIUM.

10 Cyme leafless. Lvs. oblong, obtuse. Caps. conic-ovoid. *M.S.* H. NUDIFLÒRUM.

10 Cyme leafless. Lvs. oblong-linear, obtuse. Caps. glob. *W.* H. SPHÆROCÁRPON.

10 Cyme few-leaved. Lvs. lanceolate, acute, half-erect. *M.W.* H. ADPRÉSSUM.

10 Cyme few-leaved. Lvs. lance-linear, acute, spreading. *S.* H. DOLABRIFÓRME.

11 Herb rough-downy. Lvs. lance-ovate, erect. Stem terete. *S.* H. PILÒSUM.

11 Herb smooth. Lvs. ovate, acute, erect. St. sharply square. *S.* H. ANGULÒSUM.

11 Herb smooth. Lvs. elliptical, obtuse, thin. Stem square. H. ELLÍPTICUM.

12 Lvs. ovate, clasping, 5-veined. Cymes leafy. Sta. 6—12. *Com.* H. MUTILUM.

12 Lvs. linear, black-dotted. Cymes leafless. Sta. 5—10. *Com.* H. CANADÉNSE.

12 Lvs. awl-shaped, minute. Fls. scattered, sessile. Stem wiry. H. SARÒTHRA.

12 Lvs. linear, narrow. Fls. scattered, stalked. Sta. 10—20. *W.S.*H. DRUMMÓNDII.

ORDER 23. CARYOPHYLLA'CEÆ.—PINKWORTS.

Herbs with the stems swelling at the nodes, opposite, entire *leaves*, *sepals* 4 or 5, sometimes distinct and sometimes united into a tube, *petals* 4 or 5 (sometimes 0) with or without claws, hypogynous, *stamens* generally twice as many as the petals, *styles* 2—5, *fruit* a 1-celled (rarely 2—5-celled) capsule with numerous seeds, and an *embryo* coiled around fleshy albumen.

ANALYSIS OF THE GENERA.

- Calyx
  - not tubular.
    - Sty. 3
      - Pet. 5,
        - entire.
          - Sepals partly united. ADENÀRIUM.
          - Sepals entirely distinct. ARENÀRIA.
        - bifid, sometimes 0. Pod 3—8-valv. STELLÀRIA.
      - Petals 0. Capsule 3-celled . . . . MOLLÙGO. 1
    - Sty. 4. Petals 4, 5 or 0, entire. Pod 4 or 5-valved. . . . SAGÌNA.
    - Sty. 5. Petals 5, bifid. Pod opening by 10 teeth. . CERÁSTIUM. 2
  - tubular.
    - Sty. 2
      - Calyx having 2—4 scales at base . . . . DIÁNTHUS. 3
      - Calyx having no scales at base . . . . SAPONÀRIA.
    - Sty. 3. Capsule opening by 6 teeth . . . . SILÈNE. 4
    - Sty. 5. Capsule opening by 5 or 10 teeth . . . . LÝCHNIS. 5

1. MOLLU'GO. CARPET-WEED.

Sepals 5. Petals 0. Stamens 3—5, opposite to the sepals. Styles 3. Capsule 3-celled, 3-valved, many-seeded.—① Low or prostrate herbs, with the leaves appearing whorled.

M. VERTICILLÀTA. Stems slender, jointed, much branched, lying flat on the ground. At each joint stands a whorl of wedge-shaped or spatulate leaves of unequal size, usually about 5 in number, and a few flowers, each solitary on its stalk, which is shorter than the petioles. Flowers small, sepals white inside. In dry places. *July—Sept.*

2. CERAS'TIUM. MOUSE-EAR.

Sepals 5, ovate, acute. Petals 5, bifid or 2-cleft. Stamens 10, sometimes 5 or 4. Styles 5. Capsule cylindrical, or roundish, opening at top by 10 tooth-like valves. Seeds numerous.—Flowers white, in cymes.

1 Petals about as long as the calyx. Plants hairy....2
1 Petals much longer than the calyx. Plants hairy or downy....3
2 Pale green. Lvs. obovate. Sep. acute. Fls. at first crowded. C. VULGÀTUM.
2 Less pale, hairs sticky. Leaves lance-ovate. Sepals obtuse. C. VISCÒSUM.
3 In tufts. Lvs. linear. Ripe pods as long as the calyx. *N-E.* C. ARVÉNSE.
3 Plant sticky. Lvs. lance-obl. Pods longer than cal. *M.* C. OBLONGIFÒLIUM.
3 Erect, sticky. Ripe pods curved, thrice longer than cal. *N. W.* C. NÙTANS.

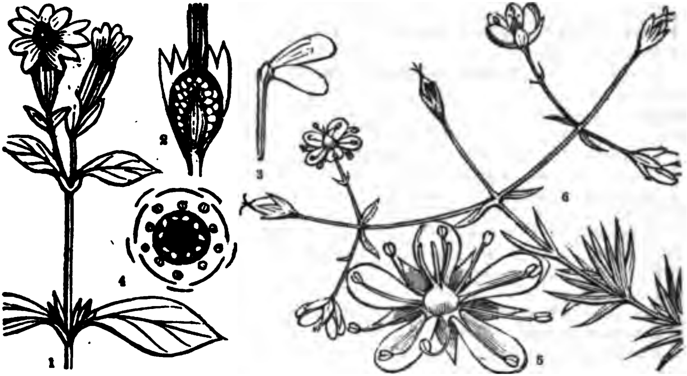


Fig. 217. 1, Lychnis diurna; 2, the ovary divided, showing the free central placentæ, the 5 styles, &c.; 3, a petal; 4, cross section of the flower, showing the arrangement of its parts; 5, Arenaria stricta, showing the spreading cyme; 6, a flower enlarged, calyx not tubular.

3. DIANTHUS. PINK. CARNATION.

Calyx tubular, cylindrical, striate, with 2 or more pairs of opposite, imbricated scales at base. Petals 5, with long claws, limb unequally notched. Stamens 10. Styles 2, with revolute stigmas. Capsule cylindrical, 1-celled.

1 Bracts as long as the calyx tube....2
1 Bracts much shorter than the calyx....3
2 Bracts erect. Leaves linear. Cymes small, 3-flowered. *Wild*...D. ARMÈRIA.
2 Bracts erect. Lvs. lanceolate. Cymes large, many-flowered.† D. BARBÀTUS.
2 Bracts spreading, leafy. Lvs. lance-linear. Fls. red, solitary.† D. CHINÉNSIS.

3 Pet. crenate, beardless. Bracts round. Plant glaucous.† D. Caryophýllus.
3 Pet. fringe-toothed, bearded. Bracts ovate. Plant glaucous.† D. plumàrius.
3 Petals fringe-pinnatifid, bearded. Bracts mucronate.†......D. supérbus.

4. SILE'NE. Catch-fly.

Calyx tubular, swelling, without scales at base, 5-toothed. Petals 5, 2-cleft, the claws often crowned with a stiff scale. Stamens 10. Styles 3. Capsule partly 3-celled, opening by 6 teeth at top.

1 Petals many-cleft and fringed. Flowers white or roseate. ♃....2
1 Petals 2-cleft or 2-parted, white or whitish....3
1 Petals 2-cleft, deep red. Root perennial. (♃)....4
1 Petals entire or merely notched....5
2 Leaves whorled in 4s. Calyx inflated. Fls. large, white......S. stellàta.
2 Leaves opposite. Calyx not inflated. Fls. white. *S. rare*.......S. ovàta.
2 Leaves opposite, hairy, obovate. Fls. very large, roseate. *S.* S. Baldwínii.
3 Calyx inflated and netted with veins. Pet. not crowned. *N-E*...S. inflàta.
3 Calyx inflated. Fls. few, large. Petals with a little crown. *W.* S. nívea.
3 Calyx close on the pod. Fls. small, in a one-sided spike. ① S. noctúrna.
3 Calyx close on the pod. Fls. stalked. Plant viscid-hairy. ① S. noctiflòra.
4 Lvs. spatulate. Fls. few, quite large (2′ wide), crimson. *S-W.* S. Virgínica.
4 Lvs. round, large (1′—2′) broad. Fls. large, tooth., scarlet. *W.* S. rotundifòlia.
5 Flowers bright scarlet, large, panicled. Lvs. lance-ovate. ♃ *W.* S. regia.
5 Fls. white, small. Some of the upper joints sticky. ①...S. Antirrhìna.
5 Fls. rose-purple. Stems clustered from a long ♃ root. S. Pennsylvánica.
5 Fls. rose-purple. Stem glaucous, from a small ① root......S. Arméria.
5 Flower purple, one only. Scape only 2′ high. (*Mts., N. H.*) ♃ S. acaulis.

5. LYCH'NIS. Cockle. Mullein-Pink, &c.

Calyx tubular, 5-toothed, without scales at base. Petals 5, clawed. Stamens 10. Styles 5. Capsule 1-celled, or 5-celled at the base, opening at the top by 5 or 10 teeth. Petals sometimes crowned.

1 Petals broad, entire. Plants very hairy....2
1 Petals 2-cleft, crowned with 2 scales at top of claw....3
1 Petals gashed or 4-cleft. Plants nearly smooth....4
2 Sepals longer than the crownless, purple petals. Lvs. linear...L. Githàgo.
2 Sepals shorter than the stiff-crowned petals. Lvs. broad†... L. Coronària.
3 Fls. scarlet, in a crowded, compound cyme.† (*Sweet Will.*) L. Chalcedónica.
3 Flowers light purple, in an open, loose cyme.† (*See figure.*)....L. diúrna.
4 Petals very broad, fringed with numerous teeth.† (*Chinese.*)...L. coronàta.
4 Petals divided into 4 long teeth, crowned.† (*Ragged Robin.*) L. Flos-cúculi.

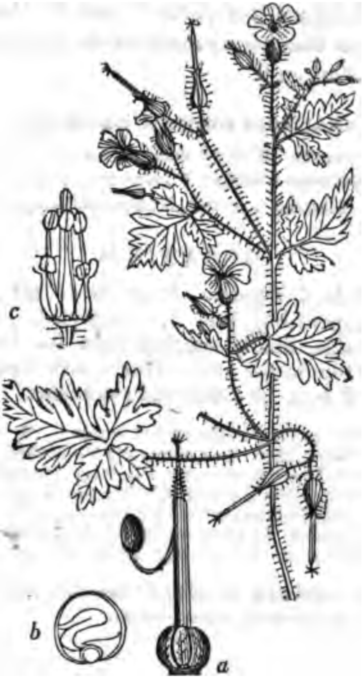


Fig. 218. Geranium Robertianum, leaves, flowers and fruit; *a* fruit enlarged, showing one carpel on its elastic style; *b*, cross section of a seed, showing the large embryo filling the whole space *c*, the 10 stamens.

ORDER 27. GERANIA'CEÆ.—GERANIA.

Herbs or shrubby plants with the lower leaves opposite, with the *flowers* regular or irregular, terminal or opposite the leaves, with the *sepals* 5, persistent, and petals 5, clawed, twisted in the bud—the *stamens* 10, monadelphous, and pistils 5, united—the carpels in *fruit* separating and bending upwards on the elastic style, each with one seed. Albumen 0.

ANALYSIS OF THE GENERA.

Corolla regular. Stamens 10, all of them perfect.............GERÀNIUM. 1
Corolla regular. Stamens 5 perfect, 5 imperfect...............ERÒDIUM.
Corolla irregular. Stamens 7 perfect, 3 imperfect..........PELARGÒNIUM.

1. GERA'NIUM.

Sepals and petals 5, regular. Stamens 10, all perfect. Fruit beaked, at last separating into 5, long-styled, 1-seeded carpels. Styles smooth inside, finally curling from the base upward, but still adhering at top to the axis.—Herbs with forked stems, much divided leaves, and 1-, 2- or 3-flowered peduncles.

1 Petals entire, twice as long as the awned sepals....2
1 Pet. notched or 2-lobed, short. Lvs. palmately 5—7-lobed. Pods hairy①....3
2 Leaves palmately 5—7-parted. St. erect. Fls. large, purple. ♃ G. MACULÀTUM.
2 Lvs. pinnately 3-divided, lfts. 2-pinnatifid. Fls. small, ②...G. ROBERTIÀNUM.
3 Sep. awned. Sd. netted on the surface. Lf.-lobes linear, 3-cleft. G. DISSÉCTUM.
3 Sep. awned. Sd. smooth. Lf-lobes wedge-obl. 5—7-cleft. G. CAROLINIÀNUM.
3 Sep. awnless. Sd. smooth. Lf.-lobes linear, 3-cleft. *M. rare.* G. PUSÍLLUM.

Observation.—The pupil will perceive by the table above, that the parlor "geraniums" belong to the genus *Pelargònium.*

ORDER 31. OXALIDA'CEÆ.—WOOD SORRELS.

Low *herbs* with a sour juice, and alternate, compound leaves, with *flowers* regular and symmetrical, 5-sepaled and 5-petaled.
Stamens 10, monadelphous, hypogynous, the alternate ones longest.
Carpels 5, united and forming in fruit a 5-celled pod.
Seeds albuminous.

OX'ALIS.—Wood Sorrel.

Sepals 5, distinct or united at base, persistent. Petals much longer than the sepals. Stamens united at the base. Styles 5. Capsule roundish or pod-shaped, cells several-seeded.—Herbs mostly ♃, with trifoliate leaves.

Fig. 219. Oxalis Acetosella. In the plan of the flower, *o*, the 5 carpels in the centre; *s*, the 10 stamens in two rows; *p*, the 5 petals; *c*, the 5 sepals; *a*, the ripe pod.

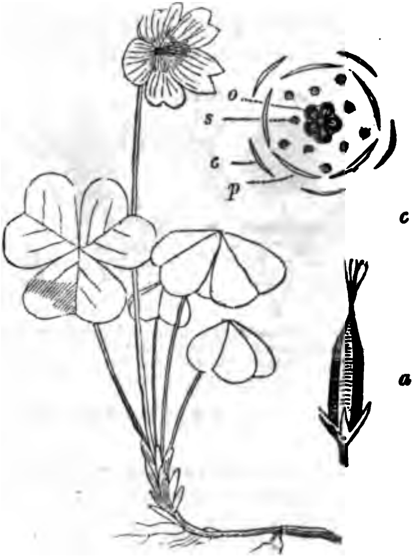


Fig. 219.

1 Stemless. Flowers white or purple....2
1 Stems leafy. Flowers yellow, few in an umbel....3
2 Scapes 1-fl. Fls. white, with purple veins. Rt.-stock creep. O. ACETOSÉLLA.
2 Scapes 2—6-flowered. Fls. violet-purple. Bulb scaly..........O. VIOLÀCEA.
3 Stem erect or ascending. Pet. entire, stalk longer than the lvs. O. STRÍCTA.
3 St. prostrate and rooting. Pet. obcord. Stalk shortr than lvs. O. CORNICULÀTA.

ORDER 37. MALVA'CEÆ.—MALLOWS.

Herbs, *shrubs* or *trees* with alternate, stipulate, divided leaves, with the *flowers* showy, axillary, regular, often with an involucel at the base, 5 *sepals* valvate and the 5 *petals* convolute in the bud, hypogynous, *stamens* indefinite and monadelphous, the anthers splitting across, *carpels* several, united into a ring or forming a several-celled capsule, *seeds* with a curved embryo in a little albumen.

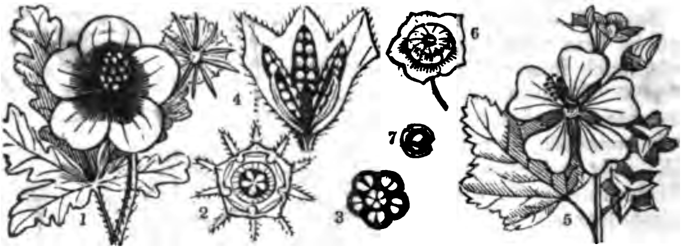


Fig. 220. 1, Hibiscus Trionum. (Flower-of-an-hour.) 2, Cross section of the flower, showing the arrangement of its parts. 3, Cross section of the 5-celled capsule. 4, Capsule open by its 5 valves. 5 Malva sylvestris. 6, Its fruit consisting of 10 carpels arranged in a circle. 7, Section of one of the carpels showing the curved embryo.

ANALYSIS OF THE GENERA.

Involucel	of 3 nearly distinct lvs.	Carpels 00, 1-seeded	MALVA.	1
		Carpels 00, 2-seeded	MODIÒLA.	
	of 3 united leaves.	Carpels numerous, 1-seeded	LAVATÈRA.	
	of 3 cordate leaves	Carpels confused, 1-seeded	MÁLOPE.	
		Capsule 3—5-celled	GOSSÝPIUM.	2
	of 6—many leaves	Carpels 00, dry, 1-seeded	ALTHÆ'A.	3
		Carp. 5, pulpy, 1-seeded	MALVAVÍSCUS.	
		Capsule 5-celled, 00-seeded	HIBÍSCUS.	4
	wanting. Carpels united,	cells 3—6-seeded	ABUTILON.	
		cells 1-seeded	SIDA.	

1. MALVA.

Calyx 5-cleft, with a 3-leaved involucel at its base. Carpels and styles numerous. Fruit cheese-form, separating when ripe into many one-seeded pieces, arranged circularly.

1 Flowers white or rose-colored....2
1 Flowers deep red or purple....3
2 Stem prostrate. Leaves round-cordate. Flowers small...M. ROTUNDIFÒLIA.
2 Stem erect, tall. Lvs. abundantly crisped and curled.†.........M. CRISPA.
2 Sts. ascend., clustered. Lvs. deeply 5-part. Fls. large, showy.† M. MOSCHÀTA.

3 Erect, tall. Lvs. roundish, lobed. Petals obcordate.....M. SYLVÉSTRIS.
3 Erect. Lvs. triangular-ovate. Pet. wedge-obovate. *N-W.* M. TRIANGULÀTA.

2. GOSSYP'IUM. COTTON.

Calyx obtusely 5-toothed, surrounded by an involucel of 3 cordate, deeply-toothed leaves. Capsule 3—5-celled. Seeds involved in cotton.—Flowers yellow.

1. G. HERBÀCEUM. Stem annual, but woody, erect, about 5f high. Leaves 5-lobed, lower ones 3-lobed or entire, each with a large gland on the mid-vein beneath, ½' from the base, and covered with dark dots. Involucels very large. Flowers very showy. Cotton white. *July.*

3. ALTHÆ'A. HOLLYHOCK, &c.

Calyx surrounded at base by a 6—9-cleft involucel. Carpels 00, 1-seeded, not opening, arranged circularly around the axis.

Lvs. downy, entire or 3-lobed. Fls. rose-col., stalked. *Marsh Mal.* A. OFFICINÀLIS.
Lvs. rough-hairy, roundish, 5—7-lobed. Fls. sessile. (*Hollyhock.*)...A. ROSEA.
Lvs. hairy, deeply 7-parted. Fls. orange-colored. (*Figleaved Holl.*) A. FICIFÒLIA.

4. HIBIS'CUS. MARSH MALLOW. FLOWER-OF-AN-HOUR, &c.

Calyx 5-cleft, surrounded by a many-leaved involucel. Styles united, stigmas 5, distinct. Fruit a 5-celled, 5—many-seeded capsule.—Flowers large, often nearly a foot broad.

1 Involucels 4—9-leaved. Herbs or shrubs....4
1 Involucels 10—15-leaved. Herbs only....2
2 Leaves ovate, mostly undivided....8
2 Leaves strongly 3—7-lobed....3
3 Corolla rose-colored and purple in the centre, or scarlet....7
3 Corolla sulphur-yellow, purple in the centre....6
4 Herbs. Corolla sulphur-yellow, purple in the centre....5
4 Herbs. Cor. purple, noding. Pod with 1-seeded cells. *E. S.* H. VIRGÍNICUS.
4 Shrub 6—10f high. Corolla purple, varying to white, 3' long.† H. SYRÌACUS.
5 Leaf-lobes linear, sub-entire; petiole shorter than the flower. H. MÁNIHOT.
5 Leaf-lobes shallow, obtuse; petiole longer than the flower. H. ESCULÉNTUS.
6 Calyx close, prickly-hispid. Bractlets 2-toothed. Very rough. *S.* H. ACULEÀTUS.
6 Calyx close, smooth. Bractlets entire. Lvs. hastate, 3-lobed...H. MILITÀRIS.
6 Calyx (in fruit) bladdery-inflated, hispid. Bractlets entire.†...H. TRIÒNUM.
7 Corolla scarlet, 8'—10' broad. Leaf-lobes lance-linear.....H. COCCÍNEUS.
7 Corolla roseate, 10'—12' broad. Lvs. cordate, thick, large. H. GRANDIFLÒRUS.

8 Leaves white-downy beneath. Petals roseate, 4′ long......H. Moscheùtos.
8 Leaves white-downy both sides. Petals sulphur-color, 4′ long...H. incànus.
8 Leaves smooth both sides. Petals purple, 4′ long. *S-E.*.....H. Carolìnus.

Order 42. ACERA'CEÆ.—Maples.

Trees or *shrubs* with opposite, usually simple palmate-veined leaves, the *flowers* often imperfect with the 5 sepals imbricated in the bud, and the *petals* 5, hypogynous, sometimes 0, the stamens mostly 8, and the *fruit* a *double samara*, with two opposite wings, 2-seeded.

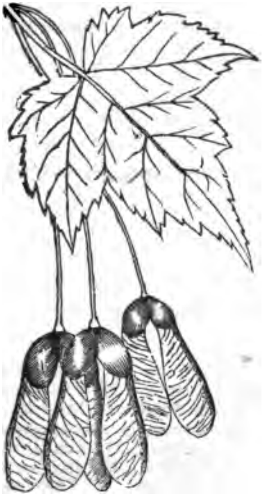


Fig. 221. Acer rubrum (Red Maple), a leaf and several samara.

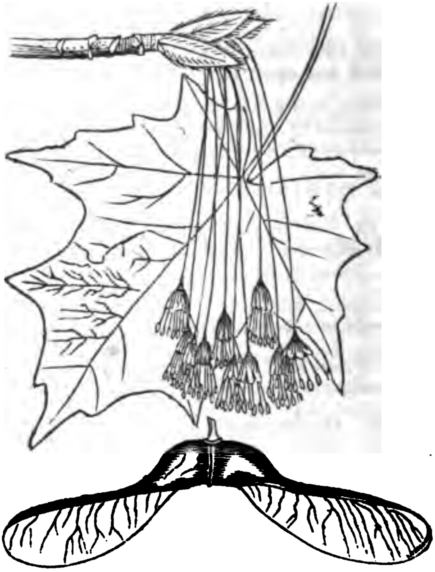


Fig. 222. Acer saccharinum (Sugar Maple), leaf, flowers and fruit.

ANALYSIS OF THE GENERA.

Leaves simple, palmate-veined..ACER. 1
Leaves compound, odd-pinnate. *Box-Elder*. ....NEGUNDO.

1. ACER. MAPLE.

Calyx of 5 united sepals, 5-lobed. Petals 5 or 0. Styles 2. Stamens 6—8.—Leaves simple, palmate-lobed. Flowers mostly polygamous.

1 Pedicels in terminal racemes, flowering after the leaves....4
1 Pedicels long, slender, drooping, flowering with the lvs. Large trees....3
1 Pedicels in side clusters, short, flowering before the leaves. Trees....2
2 Lvs. deeply lobed, square at base, silver-white beneath. Pet. 0. A. DASYCÀRPUM.
2 Lvs. lobed, cordate at base, paler beneath. Petals linear-oblong. A. RUBRUM.
3 Lvs. cordate, 5-lobed with deep, rounded openings betw'n. A. SACCHARÌNUM.
3 Lvs. closed up at base, roundish, with 3 broad shallow lobes...A. NÌGRUM.
4 Racemes erect, thyrse-like. Shrub 10—15f high, in clumps...A. MONTÀNUM.
4 Rac. drooping. Lvs. 3-lobed. Tree small, striped bark. A. PENNSYLVÀNICUM.
4 Rac. long, drooping. A large tree, exotic. Lvs. 5-lobed. A. PSEUDO-PLATÀNUS.

ORDER 47. LEGUMINO'SÆ.—LEGUMINOUS PLANTS.

***Plants* with alternate, mostly compound stipulate leaves, with 4—5 *sepals*, 5 *petals* more or less papilionaceous, sometimes regular, about 10 *stamens* monadelphous, diadelphous or distinct, a single, simple *pistil* producing a legume in fruit, and with no *albumen* in the seeds.**

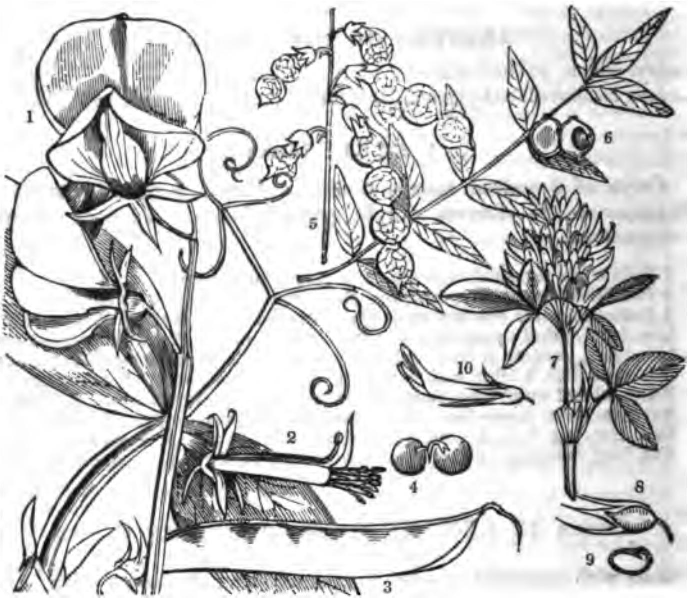


Fig. 223. 1, Sweet Pea (Lathyrus odoratus). 2, The stamens, the upper one free, and with the style bent upwards. 3, The legume (pod). 4, The seed, showing the embryo and the two large cotyledons. 5, Hedysarum boreale (a rare plant), a leaf and jointed pods (loments). 6, One of the joints open, showing the seed. 7, Red clover (Trifolium pratense). 8, The legume and part of the calyx. 9, Section of a seed. 10, A flower enlarged.

ANALYSIS OF THE GENERA.

1 Corolla papilionaceous (§ 292)....2
1 Corolla not papilionaceous....22
2 Leaves compound, unequally pinnate....6
2 Leaves compound, abruptly pinnate....3
2 Leaves compound, pinnately 3-foliate....14
2 Leaves compound, palmately 3-foliate. Trees.†..........LABURNUM.
2 Leaves compound, palmately 3-foliate. Herbs....21

2 Leaves compound, palmately 5—15-foliate. *Lupine*.........LUPÌNUS. 1

2 Leaves compound, palmately 2—4-foliate. *S*................ZORNIA.

2 Leaves simple. Herbs. *Rattle Pod*...................CROTALÀRIA.

2 Leaves simple. Shrubs. *Scotch Broom*...................GENÍSTA.

2 Leaves simple. Trees. *Judas Tree*........................CERCIS.

3 Leaves cirrhose, that is, ending with a tendril....4

3 Leaves not cirrhose. Stems erect....5

4 Style bearded on the inside, next the separate sta. *Sweet Pea.* LÁTHYRUS.

4 Style bearded on the outside. Seeds oval. *Vetch*...............VÍCIA.

4 Style bearded on the outside. Seeds globose. *Pea*............PÌSUM. 2

5 Legume very (8—12′) long, linear and slender. *S*............SESBÀNIA.

5 Legume about 2′ long. Flowers yellow, small. *S*.........GLOTTÍDIUM.

5 Legume about 3′ long. Seed-eye terminal. Fls. white. *Coffee Bean*...FABA.

6 Herbs with the legumes not jointed....7

6 Herbs with loments, i. e. with jointed legumes....12

6 Shrubs twining, unarmed, with colored bracts. *S*..........WISTÀRIA.

6 Shrubs erect, unarmed, with yellow flowers.†................COLÙTEA.

6 Shrubs erect, unarmed, with blue flowers. *W. S*...........AMÓRPHA.

6 Trees unarmed, with white flowers, in clusters. *S-W*....CLADÁSTRUS.

6 Trees or shrubs armed with spines or prickles. *Locust*.......ROBÍNIA. 3

7 Legume 1-seeded. Flowers in dense heads or spikes....8

7 Legume with 2 or more seeds....9

8 Stamens 5. Flowers small. Petals clawed. *W. S*...PETALOSTÈMON.

8 Stamens 10. Flowers small. Petals clawed. *W*............DALEA.

9 Legumes turgid or terete....10

9 Legumes flattened on the sides....11

10 Pods somewhat 2-celled by the proj. back suture. *Milk Vetch.* ASTRÁGALUS.

10 Pods 1-celled. Keel without spurs, obtuse. *r*.................PHACA.

10 Pods 1-celled. Keel with a subulate spur each side.......INDIGÓFERA.

11 Leaflets 5—7. Stems climbing and twining. Fls. purple.......APIOS. 4

11 Leaflets 5—7. Stems erect. Flowers yellow, small. *S*...CHAPMÁNNIA.

11 Lfts. 9—17. Banner large, roundish, spreading. *Goats' Rue.* TEPHRÒSIA.

11 Lfts. 9—17. Banner ovate-lanceolate, straight. *Liquorice.* GLYCIRRHÌZA.

12 Flowers in simple umbels. In gardens.....................CORONÍLLA.

12 Flowers in racemes....13

13 Stamens in 2 equal sets, 5 in each. *S. M.*..............ÆSCHYNÓMENE.

13 Stamens in 2 sets, 9 in one set and 1 alone. *N-E. r.*.......HEDÝSARUM.

14 Pods straight- or even-edged legumes....15

14 Pods notched- or crenate-edged, jointed loments....23

15 Legumes 1-seeded only, indehiscent (not opening)....16

15 Legumes mostly 2-seeded, rarely 1-seeded....17

15 Legumes with several or many seeds....18

16 Calyx with 2 bractlets at base. *Bush Trefoil*.............LESPEDÈZA. 5

16 Calyx naked, inclosing the indehiscent pod. *W. c.*..........PSORÀLEA.

17 Cal. 4-toothed. The 1—2-seeded pods under ground. Vine. AMPHICARPÆ̀A.

17 Cal. 4-toothed, upper tooth bifid at apex. Stem erect. *S.*.......PITCHÈRIA.

17 Cal. 5-toothed, the 2 upper partly united. Mostly trailing. *S.* RHYNCHÒSIA.

17 Cal. equally 5-toothed. Stem erect. *Sweet Clover*..........MELILÒTUS.

18 Calyx 5-toothed....19

18 Calyx 4-toothed or cleft....20

18 Calyx nearly entire. Flowers and seeds scarlet. *S.*........ERYTHRÌNA.

19 Keel and included stamens spirally twisted or coiled.........PHASÈOLUS. 6

19 Keel obtuse, on short claws. Banner spurred behind. *S.*...CENTROSÈMA.

19 Keel acute, on long claws. Banner very large, spurless. *S.*...CLITÒRIA.

20 Banner with 2 or 4 callous spots at the base. *S.*............DÓLICHOS.

20 Banner without callosities, broad. Bracts deciduous. *S.*......GALÁCTIA.

21 Stamens diadelph. (9 & 1). Legume curved or spiral. *Medick.* MEDICÀGO.

21 Sta. diadelph. (9 & 1). Legume small. Fls. in heads. *Clover.* TRIFÒLIUM. 7

21 Sta. 10, distinct, equal. Fls. racemed, &c. *False Indigo*......BAPTÍSIA. 8

22 Herbs armed with hooked spines. Corolla regular. *S.*....SCHRÁNKIA.

22 Herbs unarmed and smooth. Corolla regular. *S-W.*...DARLINGTÒNIA.

22 Herbs unarmed. Corolla irregular, yellow...................CASSIA. 9

22 Herbs unarmed. Corolla regular, valvate, yellow.............ACÀCIA.

22 Shrubs with a regular corolla and sensitive leaves............MIMÒSA.

22 Trees unarmed. Leaves unequally bipinnate. *M. S. W.* GYMNÓCLADUS.

22 Trees unarmed. Leaves abruptly bipinnate. *S.* ACÀCIA JULIBRÁSSIN.

22 Trees armed with simple spines. Flowers yellow. *S.*.......VACHELLIA.

22 Trees armed with triple spines. Fls. green. *Honey Locust.* GLEDÍTSCHIA.

23 Loment 2-jointed and 1-seeded. Flowers yellow. *S.*....STYLOSÁNTHES.

23 Loment several-jointed and several-seeded. Fls. white, &c. DESMÒDIUM.

1. LUPI'NUS. Lupine.

Calyx deeply 2-lipped, upper lip 2-cleft, lower entire or 3-toothed. Wings united towards the top, keel acuminate. Stamens monadelphous, the filaments forming an entire sheath. Anthers alternately oblong and globose. Pod leathery and knotted.—Herbs, with leaves palmately 5—15-foliate.

L. perénnis. Root creeping, perennial. Stem erect, 1—2f high, hairy. Leaflets soft-downy, 7—11, oblanceolate; 1½—2′ long, broadest above the middle. Flowers alternate, in an erect, terminal raceme, blue, varying to white. Calyx without appendages, upper lip emarginate, lower entire. It is often called *Sun-dial*, from the fact of its leaves turning to face the sun from morning till night.—Several other species are cultivated in gardens. *May, June.*

2. PI'SUM. Pea.

Calyx divisions leaf-like, 2 upper shortest. Banner large, reflexed. Stamens 10, diadelphous (9 & 1). Style flattened, keel-shaped, bearded on the upper side. Legume oblong, tumid. Seeds globose —Climbing herbs. Leaves pinnate, ending with a branching tendril.

P. satìvum. (*Common Garden Pea.*) Leaflets usually 4, ovate, entire. Stipules rather larger than the leaflets (2—3′ long), ovate, half-cordate at base. Flowers 2 or more on axillary peduncles, large, white Pods 2 or 3′ long, 5—9-seeded. A very valuable leguminous plant all over smooth and glaucous. There are many varieties. *June.*

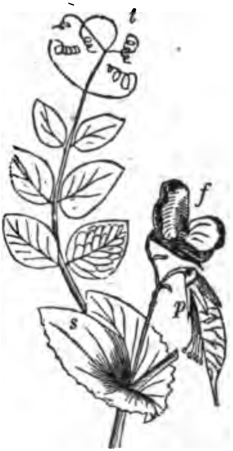


Fig. 224. Common Pea. *s*, The large stipules; *p*, the pod; *f*, the flower; *t*, the tendrils on the end of the leaf.

3. ROBIN'IA. Locust.

Calyx short, bell-shaped, 5-cleft, the 2 upper divisions more or less united. Banner large, wings obtuse. Stamens diadelphous (9 & 1). Style bearded inside. Legume flattened, long, many-seeded.—Trees and shrubs with stipular spines. Leaves unequally pinnate. Flowers

1 Trees with spines, soft foliage, and racemes of white flowers....2.
1 Shrubs 4—9f high, hispid, with clusters of large, purple fls....R. híspida.
2 Racemes loose and slender, fragrant, drooping, smooth.....R. Pseudacácia.
2 Racemes rather compact, rose-white. Branchlets and stalks sticky. R. viscòsa.

4. APIOS. Ground-nut.

Calyx bell-shaped, somewhat 2-lipped, the 2 side teeth nearly obsolete, the lower tooth longest. Keel incurved and at length coiled against the very broad, reflexed banner. Ovary sheathed at base.—Twining, smooth herbs.—♃ Root bearing eatable tubers. Leaves pinnately 5—7-foliate.

A. tuberosa. Stem round, twining about other plants, 2—4f in length. Leaflets mostly 7, narrow-ovate, more or less acuminate, on short stalks. Racemes axillary, solitary, dense-flowered, shorter than the leaves. Flowers dark purple. The tubers on the root are oval, thick, and very nutritious. In thickets and shady woods. *July, Aug.*

5. LESPEDEZA. Bush Clover.

Calyx 5-parted, with 2 bractlets at base, the sepals nearly equal. Keel very obtuse, on slender claws. Stamens diadelphous (9 & 1). Legume lens-shaped, small, flattened, unarmed, one-seeded, not opening.—♃ Leaves pinnately trifoliate. Flowering in *Aug., Sept.*

1 Flowers in dense spikes, whitish, with a purple spot on the banner....2
1 Fls. racemed, &c., violet or purple. Some of the fls. with no corolla....3
2 Leaflets elliptical, silky. Spikes shorter than the leaves. Erect. L. capitàta.
2 Leaflets roundish-oval. Spikes longer than the leaves. Erect.....L. hirta.
3 Stems prostrate, trailing, diffuse. Leaflets oval....4
3 Stem erect and mostly branched, 1—3f high....5
4 Plants clothed with down, except the upper side of the lvs...L. procúmbens.
4 Plants nearly smooth, very slender and delicate. *M. S.*.........L. repens.
5 Clusters few-flowered, loose. Plants smoothish. Pods ovate....6
5 Clusters many-flowered, dense. Plants downy. *M. S.*........L. Stùvei.
6 Leaflets oval, obtuse, 6—12″ long, 4—8″ wide. Plant bushy....L. violàcea.
6 Leaflets oval-oblong, 3—6″ long, 1—2″ wide. Plant bushy. L. sessiliflòra.
6 Lflts. linear, 10—18″ long, 1½—3″ wide. Smooth, subsimple. L. reticulàta.

6. PHASEOLUS. Bean, &c.

Calyx 5-toothed or cleft, the 2 upper teeth half united. Keel including the stamens and style, and with them spirally coiled or twisted. Legume straight or curved, many-seeded. Seeds oblong, kidney-shaped.—Herbs twining or trailing. Leaves pinnately trifoliate, stipellate. *June—Oct.*

1 Species growing only by cultivation....3
1 Species growing wild in fields and woods....2
2 Pods curved and flattened. Racemes loose, panicled....5
2 Pods straight, teretish. Flowers in very short, dense racemes or heads....6
3 Pods nearly straight, terete or knotted....4
3 Pods curved, flattened, with flattened seeds. Stem twining...P. LUNÀTUS.
4 Fls. scarlet and showy. Stem twining. Root tuberous, ♃...P. MULTIFLÒRUS.
4 Fls. white. Stem twining. Seeds variously colored..........P. VULGÀRIS.
4 Fls. white. Stem erect, bushy. Seeds mostly white, small.......P. NÀNUS.
5 Leaflets round, ovate, short-pointed, entire..................P. PERÉNNIS.
5 Leaflets divided into 2 or 3 rounded lobes. *S.*...............P. SINUÀTUS.
6 Leaflets 2 or 3-lobed. Ped. 1 or 2 times longer than the lvs. P. DIVERSIFÒLIUS.
6 Leaflets all entire. Peduncles 4 or 5 times longer than the lvs. P. HÉLVOLUS.
6 Lflts. all entire, linear-oblong. Ped. twice longer than the lvs. P. LEIOSPÉRMUS.

7. TRIFO′LIUM. CLOVER. TREFOIL.

Calyx 5-cleft, with bristly teeth, persistent. Petals more or less united at the base, persistent and withering. Banner longer than the wings, which are also longer than the keel. Stamens 10, diadelphous (9 & 1). Legume short, membranous, often included in the calyx, 1—6-seeded, mostly indehiscent.—Herbs with palmately trifoliate leaves. Leaflets straight-veined. Flowers in heads or spikes. *Apr.—Sept.*

1 Flowers purple or roseate, sessile in compact heads....3
1 Flowers white or roseate, pedicellate, in long-stalked heads....2
1 Flowers yellow, persistent, changing to brown when old....7
2 Stipules membrane-like. Plants smooth. Leaflets broad-obcordate....5
2 Stipules leaf-like, green. Plants downy. Pods 3—5-seeded....6
3 Heads roundish or ovate, corollas larger than the calyx teeth....4
3 Heads oblong-cylindric, very hairy with long plumose sepals. T. ARVÉNSE.
4 Stipules broad-ovate, bristle-pointed. Leaflets whitish spotted. T. PRATÉNSE.
4 Stipules narrow-lanceolate. Leaflets spotless. Stem zigzag....T. MÈDIUM.
5 Stems all creeping. Peduncles 5′—8′ long. Pods 4-seeded...T. RÈPENS.
5 Flowering sts. erect. Hds. 1′ thick. Pods 2-seeded. *W.* T. STOLONÍFERUM.
6 Ascending. Leaflets obovate-oblong. Hds. 40—50-flowered. *W.S.*T. REFLÉXUM.
6 Finally diffuse. Lflts. wedge-obcord. Hds. 10—20-flow. *S.* T. CAROLINIÀNUM.
7 Lflts. all nearly sessile (palmately 3-foliate). Hds. ½′ thick. T. AGRÀRIUM.

8. BAPTI'SIA. WILD INDIGO.

Calyx 4—5-cleft half way. Petals of about equal length, somewhat united. Banner roundish, notched at the end. Stamens 10, distinct, deciduous. Pod inflated, many-seed, raised on a stalk in the persistent calyx.—♃ Large herbs with leaves palmately 3-foliate or simple. Flowers in racemes. Leaflets mostly oblong, broadest above. *Apr.—Sept.*

1 Leaves simple. (Several species far to the South omitted.)
1 Leaves palmately trifoliate....2
2 Stipules minute and caducous (soon falling off)....3
2 Stipules large and mostly persistent....8
3 Flowers white or cream-color....7
3 Flowers yellow....4
4 Flowers large (an inch or more in length)....6
4 Flowers small (half an inch long)....5
5 Pedicels bractless, shorter than the flowers.................B. TINCTÒRIA.
5 Pedicels with 2 bracts, longer than the flowers. *S.*..........B. LECÓNTII.
6 Peds. shorter than the calyx. Rac. long, spike-form. *S.*..B. SPHÆROCÁRPA
6 Peds. longer than the calyx. Fls. nodding, few in the rac...B. MEGACÁRPA.
7 Flowers white, in a long raceme. Hight 2f. *S.*................B. ÁLBA.
7 Flowers yellowish-white, axillary. Hight 2—3f. *S.*.....B. LANCEOLÀTA.
8 Flowers white or whitish....9
8 Flowers indigo-blue, very large. *M. S.* (Gardens.)..........B. AUSTRÀLIS.
9 Downy. Flowers grayish, erect. Leaves nearly sessile. *S.*..B. VILLÒSA.
9 Hairy. Flowers cream-colored, drooping. *W. S.*........B. LEUCOPHǼA.
9 Smooth. Flowers white. Leaflets wedge-obovate. *W.*....B. LEUCÁNTHA.

9. CAS'SIA. WILD SENNA.

Sepals 5, scarcely united at base, nearly equal. Petals 5, unequal, but not papilionaceous. Stamens 10, distinct, 3 upper anthers often sterile, 3 lower ones beaked. Legume many-seeded.—Leaves simply and abruptly pinnate, mostly with a gland on the petiole Flowers yellow. *July, Aug.*

1 Racemes axillary. 3 of the anthers imperfect, 7 of them perfect....2.
1 Racemes above the axils. Anthers all perfect. Stem 1—2f high....3.
2 Leaflets 4—6, obtuse. Pods 6′ long. Stem 1—3f high. *S.*...C. OBTUSIFÒLIA.
2 Leaflets 6—12, acute. Pods 5′ long. Stem 4—6f high. *S.*..C. OCCIDENTÀLIS.
2 Leaflets 12—18, mucronate. Pods 4′ long. Stems 5f high. C. MARILÁNDICA.
3 Anthers 10, unlike. Fls. large. Leaflets 16—24.......C. CHAMÆCRÍSTA.
3 Anthers 5, alike. Fls. small. Leaflets 12—30.............C. NICTÌTANS.

ORDER 48. ROSA'CEÆ.—ROSEWORTS.

Trees, *shrubs* or *herbs* with stipules mostly, and alternate leaves, with *flowers* regular, commonly showy, perfect, and polyandrous, with 5 *sepals* united at base, often supported by as many bractlets outside, 5 *petals* (rarely 0), which are perigynous as well as the stamens. 1—00 *pistils* which are distinct, or sometimes united and adhering to the calyx tube. *Fruit* various. *Seeds* with no albumen.

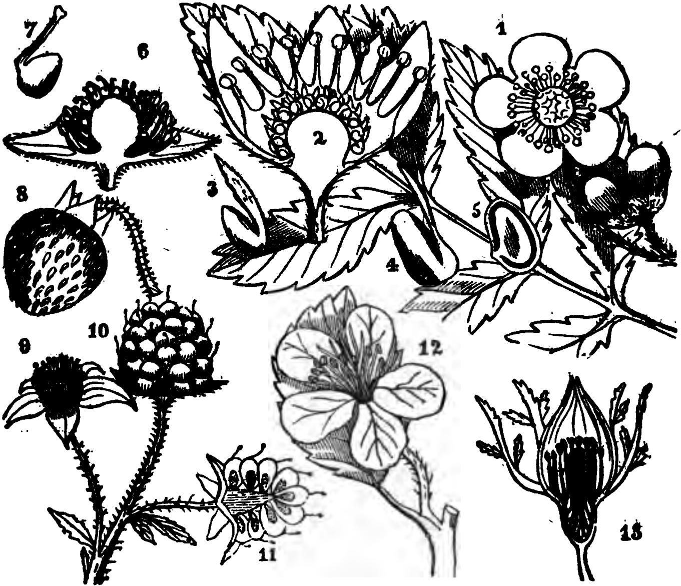


Fig. 225. 1, Potentilla arguta, flower and leaf. 2, Vertical section of a flower with the petals removed, showing the perigynous disk, stamens, ovaries, &c. 3, Enlarged ovary and style. 4, Mature ovary. 5, Section showing the seed and seed-stalk. 6, Vertical section of a flower of Fragaria, showing the perigynous stamens, the ovaries, &c. 7, Enlarged carpel. 8, Fruit, consisting of the enlarged receptacle with the achenia outside. 9, Perigynous stamens of Garden Raspberry. 10, Fruit, the fleshy carpels clustered. 11, Section of the fruit. 12, Flower of the apple tree. 13, Section of a rose, showing the distinct carpels in the calyx tube.

ANALYSIS OF THE GENERA.

1 Calyx open and free from the naked ovary or ovaries....2
1 Calyx tube adherent to the ovaries or, at least, inclosing them....5
2 Ovary or pistil one only. Fruit a drupe (stone-fruit)....3
2 Ovaries or pistils few or many (3—50). Fruit not a drupe....9
3 Calyx persistent. Style lateral. Shrubs far south....CHRYSOBALÀNUS.
3 Calyx deciduous. Style terminal. Trees and shrubs....4
4 Stone smooth, globose. Fruit smooth but not glaucous. *Cherry*. CÉRASUS. 1
4 Stone smooth, flattened. Fruit smooth. *Plum*.................PRÙNUS.
4 Stone smooth, flattened. Fruit downy. *Apricot*............ARMENÌACA.
4 Stone roughened with pits and furrows. Fruit fleshy. *Peach*...PÉRSICA.
4 Stone roughened with pits and furrows. Fruit dry. *Almond*. AMÝGDALUS.
5 Calyx tube cohering with the 2—5 ovaries; fruit a pome....6
5 Calyx tube inclosing the ovaries, but not cohering with them....7
6 Petals roundish. Pome with bony, 1-seeded cells. *Thorn-bush*. CRATÆ̀GUS.
6 Petals roundish. Pome with thin, 2-seeded cells. *Apple, &c*.....PỲRUS. 2
6 Petals roundish. Pome with 5, many-seeded cells. *Quince*.....CYDÒNIA.
6 Pet. narrow-obovate. Pome with 5 double cells. *Shad-bush*. AMELÁNCHIER. 3
7 Carpels numerous. Petals 5—00. Stamens many. *Rose*........ROSA. 4
7 Carpels 1—4. Petals wanting....8
7 Carpels 1—4. Petals 5. Sta. 00. Fls. small, yellow......AGRIMÒNIA.
8 Sta. 1—4. Lvs. palmate, all radical. Mountains. *N*......ALCHEMÍLLA.
8 Sta. 4. Lvs. pinn., cauline. Gardens. *Burnet Saxifrage*....SANGUISÓRBA.
8 Sta. 20—30. Leaves pinnate, cauline. Gardens. *Burnet*....POTÈRIUM.
9 Fruit seed-like (achenia)....10
9 Fruit a compound berry (§ 385) composed of many little drupes. RÙBUS. 5
9 Fruit several little follicles....14
10 Achenia on a dry and flattish receptacle....11
10 Ach. on a spongy receptacle which is tasteless. Fls. purple. CÓMARUM.
10 Achenia on a juicy receptacle which is sweet and eatable.....FRAGÀRIA. 6
11 Styles persistent on the fruit....12
11 Styles deciduous after flowering....13
12 Petals and sepals 8 or 9. A low plant, on mountains. *N*........DRỲAS.
12 Petals and sepals 5. Achenia numerous. *Avens*................GEUM. 7

13 Plants with cauline, compound leaves. Stamens 00.....Potentílla. 8
13 Plants with cauline, compound leaves. Sta. 5. *Mts. N.*..Sibbáldia.
13 Plants with cauline, undivided leaves. Bractlets 0......Dalibárda. 9
13 Plants with the leaves all radical. Flowers yellow....Waldsteínia. 10
14 Follicles 2—10-seeded. Flowers white or rose-color....15
14 Follicles 1-seeded. Fls. (double) yellow. Shrub in gardens...Kérria.
15 Petals obovate, equal. Leaves simple or pinnate..........Spiræ'a. 11
15 Petals lance-linear, unequal. Leaves 3-foliate............Gillènia.

1. CER'ASUS. Cherry

Calyx 5-cleft, regular, deciduous. Petals 5, much spreading. Stamens 15—30. Ovary with 2 ovules. Drupe globular, very smooth, destitute of a glaucous bloom. Stone also globular and smooth.—Trees or shrubs. Leaves folded in the bud. Fls. early, white. *May.*

1 Flowers in umbel-like clusters from side buds. Fruit red....2
1 Flowers in racemes. Cherries black or nearly so....5
2 Trees erect, usually of small size....3
2 Shrubs trailing, with lance-obovate leaves. *Sand Cherry*........C. púmila.
3 Trees cultivated for their large, red fruit....4
3 Trees wild, with small red cherries. *Wild Red, N.*....C. Pennsylvánica.
4 Leaves oblong-ovate. Fruit cordate at base. *Ox-hearts, &c.*....C. A'vium.
4 Lvs. lance-ovate. Cherries globose. Tree smaller. *Large Red.* C. vulgàris.
5 Racemes at the end of leafy branches. Leaves deciduous....6
5 Racemes in the axils of the persistent, evergreen lvs. *S.*..C. Caroliniàna.
6 Trees with lance-oblong, blunt-toothed leaves. *Wild Black*....C. serotìna.
6 Shrubs with oval-obovate, slender-toothed leaves. *Choke*....C. Virginiàna.

2. PY'RUS. Pear. Apple.

Calyx urn-shaped, limb 5-cleft. Petals 5, roundish. Stamens 00. Styles 2—5. Pome fleshy or berry-like, containing 2—5 cartilaginous (thin and elastic) carpels, each with 2 seeds.—Trees or shrubs. Leaves simple or pinnate. Flowers showy, white or rose-colored, in cyme-like umbels. *May, June.*

1 Leaves simple....2
1 Lvs. pinnate. Clusters with very numerous fls. and scarlet berries....3
2 Trees with the flowers in simple (single) clusters....4
2 Wild shrubs 5—8f high. Clusters compound. *Choke-berry.* P. arbutifòlia.

3 Tree 10—20f high, with acuminate leaflets. *Mountain Ash*..P. AMERICÀNA.
3 Tree 20—40f high, with acute leaflets. *Rowan-tree*.........P. AUCUPÀRIA.
4 Styles united and woolly at base. Fls. large and fragrant. Fr. round....5
4 Styles distinct....6
5 Leaves smoothish, cut-serrate or lobed. *Sweet-scented Crab*..P. CORONÀRIA.
5 Leaves downy, blunt-serrate. Calyx woolly. *Apple-tree*.......P. MÀLUS.
6 Lvs. lance-oblong, serrate. Fr. round. *Narrow-leaved Crab*. P. ANGUSTIFÒLIA.
6 Leaves ovate, nearly entire. Fruit pear-form. *Pear-tree*......P. COMMÙNIS.

3. AMELAN'CHIER. June-berry.

Calyx 5-cleft. Petals 5, oblong-ovate and oblanceolate. Stamens short. Styles 5, somewhat united at base. Pome 5-celled, cells cartilaginous, each nearly divided into two 1-seeded divisions. Small trees or shrubs with simple, serrate leaves, and white early flowers in racemes.

A. CANADÉNSIS. *Shad-berry. June-berry.* A small tree or shrub found in woods, with a dark grayish bark. Flowers large white, in racemes at the ends of the branches, appearing in April and May, while the forests are yet naked. Fruit round, purplish, well-flavored, ripe in June. The plant is very variable in size, and in the leaves, &c.

4. RO'SA. Rose.

Calyx tube urn-shaped, fleshy, contracted at the throat, limb 5-cleft, the sepals generally with a little leaf at tip. Petals 5 (greatly multiplied by culture); achenia 00, bony, hispid, included in and attached to the inside of the fleshy calyx tube.—Shrubby and prickly plants. Leaves unequally pinnate. Stipules attached to the petiole. *Apr.—July, mostly.*

1 Roses growing wild in the United States....2
1 Cultivated roses, never growing wild here. (All omitted.)
2 Stems long, flexible, climbing or trailing. Leaflets generally but three....9
2 Stems erect, not climbing or trailing....3
3 Armed with straight spines, or nearly straight....6
3 Armed with hooked or curved, strong spines....4
4 Leaflets smoothish, simply serrate, not fragrant....5
4 Leaflets rusty with glands beneath, doubly-serrate, very fragrant....8
5 Leaves dull green. Fls. in corymbs. *N. M.* *Swamp Rose*...R. CAROLÌNA.
5 Leaves shining green. Fls. solitary. *S-W. Macartney*......R. BRACTEÀTA.
6 Peduncles and calyx bristly. Leaves shining....7
6 Peduncles and calyx smooth. Prickles few. *N.* *Bland*.......R. BLÀNDA.

7 Leaflets elliptical. Stems green, with few prickles............R. LUCIDA.
7 Lfts. narrow-lance. Stems reddish, prickles very numerous. *N.* R. NÍTIDA.
8 Cal. persist. Some of the prickles awl-shaped. *Sweet-briar*...R. RUBIGINÒSA.
8 Calyx decid. All the prickles hooked alike. *Small-flowered*...R. MICRÁNTHA.
9 Fls. corymbose, rose-colored, changeable. *W. S.* *Prairie*.....R. SETIGERA.
9 Fls. solitary, white. Stipules bristle-form. *S.* *Cherokee*....R. LÆVIGATA.

5. RU'BUS. BRAMBLE. BLACKBERRIES AND RASPBERRIES.

Calyx 5-parted, without bractlets. Petals 5, deciduous. Stamens 00. Ovaries many, becoming many pulpy, drupe-like achenia (grains) united into a compound fruit.—Half-shrubby plants with ♃-roots and ② stems, armed with prickles. Flowers mostly white. In the *Blackberries* the pulpy receptacle constitutes a part of the fruit, but in the *Raspberries* it does not.

1 Leaves simple, 3—5-lobed. Flowers large....4
1 Leaves compound, of 3—7 leaflets....2
2 Stems stout, upright, often recurved at top....3
2 Stems weak, trailing or prostrate....7
3 The side leaflets stalked. Prickles strong, recurved....8
3 The side leaflets sessile. Prickles weak, nearly straight....5
Raspberries.
4 Petals round, purple. Stalks hairy-clammy. *Rose Flowering*...R. ODORÀTUS.
4 Pets. broad-oval, white. Fls. several. *N-W.* *White Flowering*. R. NUTKÀNUS.
4 Pets. obovate, white. Fl. only one. *Mounts.* *Cloud-berry*..R. CHAMÆMÒRUS.
5 Petals as long or longer than the calyx....6
5 Petals shorter than the calyx. *Garden Raspberry*..............R. IDÆUS.
6 Corolla cup-shaped, single. *Wild Red Raspberry*...............R. STRIGÒSUS.
6 Corolla spreading, double. *Bridal Rose. Cultivated*..........R. ROSÆFÒLIUS.
7 Stems prickly, shrubby, biennial. Fruit of many grains....10
7 Stems entirely unarmed, green, ① Fruit of few grains.....R. TRIFLÒRUS.
8 Pl. glaucous. Pets. shorter than sep. Fr. dark. *Thimble-berry*. R. OCCIDENTÀLIS.
8 Plants not glaucous. Petals much longer than the sepals....9
Blackberries.
9 Flowers in racemes. Leaflets ovate. *High Blackberry*.......R. VILLÒSUS.
9 Fls. 1—3 together. Lfts. wedge-obovate. *M.S.* *Sand Blackb.* R. CUNEIFÒLIUS.
10 Prickles many. Flower-stalks without leaves or bracts....11
10 Prickles few. Flower-stalks with leafy bracts. *Dewberry*..R. CANADÉNSIS.
11 Flowers small, with spreading sepals. *Hispid, Running Bl.*..R. HÍSPIDUS.
11 Flowers large, with reflexed sepals. *S.* *Low Bush Bl.*.....R. TRIVIÀLIS.

6. FRAGA'RIA. STRAWBERRY.

Calyx deeply 5-cleft, with an equal number of alternate bractlets outside. Petals 5, obcordate. Stamens 00. Achenia many, fixed to the surface of the large, conical, pulpy, scarlet or white receptacle. —Low ♃ stemless plants with trifoliate leaves, cymes of white flowers on scapes, and sending out runners from the base. Our two native species can be distinguished by the fruit only, the leaves and flowers being alike. Thus:

F. Virginiàna. Recep. holding the achenia in little pits, roundish egg-shaped.
F. vesca. Receptacle holding the achenia on its even surface, cone-shaped.

7. GE'UM. Avens.

Calyx 5-cleft, usually with 5 alternate bractlets outside. Petals 5. Stamens many, collected on a dry receptacle and bearing the long, persistent style.—♃ Leaves pinnate or lyrate.

1 Style bent and jointed near the middle....2
1 Style straight and not jointed, wholly persistent. Rare plants....6
2 Head of fruits quite sessile, with the styles finally hooked....3
2 Head of fruits stalked in the calyx more or less....5
3 Petals yellow, longer than the calyx....4
3 Petals white, as long as the calyx. Receptacle hairy....G. Virginiànum.
4 Lvs. ending with a very large roundish leaflet. *Mounts*...G. macrophýllum.
4 The end leaflet but little larger than the rest. Hight 3—5f....G. stríctum.
5 Petals yellow, small. Stalk as long as the head. *W*..........C. vernum.
5 Whole flower dark purple, large, nodding. *Water Avens*.......G. rivàle.
6 Bractlets longer than the calyx or *purplish* petals. Fls. 3. *W*...G. triflòrum.
6 Bractlets minute. Petals yellow. Stem almost leafless. *Mts*....G. Peckii.

8. POTENTIL'LA. Cinquefoil.

Calyx deeply 4—5-cleft, with an equal number of alternate bractlets outside. Petals 4—5, obcordate. Stamens 00. Achenia 00, collected in a head on a small, dry receptacle.—Herbs or shrubs with compound leaves and (mostly) yellow flowers.

1 Leaves palmately compound....2
1 Leaves pinnately compound....6
2 Leaflets 3 only in each leaf....3
2 Leaflets 5. Stems prostrate or inclining....5
3 Flowers yellow. Stems herbaceous....4
3 Fls. white. Lfts. wedge-obovate, 3-toothed at end. *N*.....P. tridentàta.
4 Erect, many-flowered. Petals shorter than the sepals. *N. M.*.P. Norvègica.
4 Low, tufted. Stems 1-flowered. Pet. longer than sepals. *Mts*....P. mínima.

5 Leaflets green both sides, serrate, oblong. Ped. 1-flowered.. P. Canadénsis.
5 Lfts. silvery-white beneath, pinnatifid. Flowers in cymes...P. argéntea.
6 Erect, handsome shrubs with yellow flowers. Hight 1—2f. *N*..P. fruticòsa.
6 Stemless herbs. Leaves and peduncles radical. *Goose-grass*....P. Anserìna.
6 Herbs with leafy stems. (3 rare species—omitted.)

9. DALIBAR'DA. False Violet.

Calyx deeply 5 or 6-parted, 3 of the segments larger. Petals 5. Stamens many. Styles 5—8, long, deciduous. Fruit 5—8 dryish drupe-like achenia.—♃ Low herbs with creeping stems, simple leaves and 1—2 white flowers on each stalk. *N.*

D. rèpens. Found in damp woods. Creeping stems a few inches to a foot in length. Leaves roundish-cordate, crenate. Stipules very narrow-linear. Petioles 1—3′ long. Scapes 1-flowered, about as long as the petioles. *June.*

10. WALDSTEI'NIA. Dry Strawberry.

Calyx 5-cleft, with 5 alternate, sometimes minute and deciduous bractlets. Petals 5 or more, sessile. Stamens many. Styles 2—6. Achenia few, dry, on a dry receptacle.—♃ Acaulescent herbs with lobed or divided radical leaves and yellow flowers on scapes.

W. fragarioìdes. A pretty plant, in hilly woods, bearing some resemblance to the strawberry. Root-stock thick, scaly, blackish. Leaves trifoliate, on petioles 3—6′ long; leaflets broad-wedge-shaped, cut-toothed, of a shining green above. Scapes about as high as the leaves, bearing 2—6 flowers, which are ½′ across. *June.*

W. lobàta. Along rivers, &c. *Leaves simple*, roundish-cordate, generally *3—5-lobed*, &c. *Apr.—June. S.*

11. SPIRÆ'A. Meadow-sweet. Hard-hack.

Calyx 5-cleft, persistent. Petals 5, roundish. Stamens 10—50, exserted. Carpels distinct, 3—12, forming little 1-celled, several-seeded pods. Styles terminal.—♃ Beautiful, unarmed herbs or shrubs with alternate leaves and branches, and small white or rose-colored flowers. *May—Aug.*

1 Shrubs 4—9 feet high....2
1 Herbs with the leaves once or thrice pinnate....7
2 Stipules present....4
2 Stipules none. Leaves simple and undivided....3

3 Flowers in panicles. Leaves lance-ovate....5
3 Flowers in corymbs or little umbels. Leaves oval or ovate....6
4 Lvs. simple, 3-lobed. Corymbs umbellate. *N.* *Nine-bark*....S. OPULIFÒLIA.
4 Leaves odd-pinnate. Flowers in panicles. Cultivated......S. SORBIFÒLIA.
5 Lvs. with a rusty white dense wool beneath. *Hard-hack*....S. TOMENTÒSA.
5 Lvs. nearly smooth. Shrub 3 or 4f high. *Willow-leaved*...S. SALICIFÒLIA.
6 Corymb very large terminal, flat-topped. Hight 1—2f. *S.*...S. CORYMBÒSA.
6 Little umbels many, lateral. Cultivated. *St. Peter's Wreath.* S. HYPERICIFÒLIA.
7 Leaves once-pinnate. Inflorescence terminal, on a long stalk....8
7 Leaves thrice-pinnate. Stip. 0. Fls. in slender spikes. *M.*...S. ARÚNCUS.
8 Flowers purple. Side leaflets 3-lobed. *W.* *Queen of the Prairie*..S. LOBÀTA.
8 Fls. white. Lfts. pinnatifid-serrate. Gardens. *Dropwort*..S. FILIPÉNDULA.
8 Flowers white. Lfts. doubly-serrate. Gardens. *Meadow-sweet*..S. ULMÀRIA.

ORDER 55. ONAGRA'CEÆ.—EVENING PRIMROSES.

Herbs with alternate or opposite leaves, and with the parts of the _flowers_ generally in 4s, sometimes in 3s, 2s or 1s; with the _sepals_ united below into a tube, valvate in the bud; the _petals_ and stamens inserted into the throat of the calyx; _ovary_ coherent with the tube of the calyx, becoming in the _fruit_ a 2—4-celled capsule or berry with many seeds.

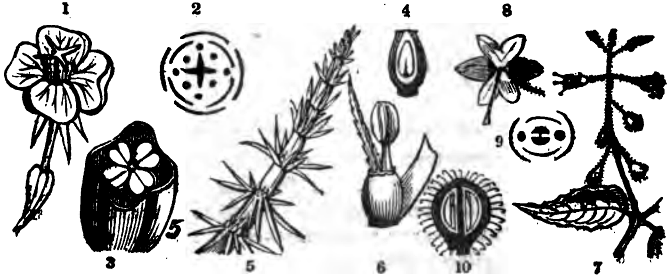


Fig. 226. 1, flower of Œnothera fruticosa; 2, plan of the flower; 3, section of the 4-celled capsule of Œ. biennis; 5, Hippuris vulgaris; 6, its flower, with 1 stamen, 1 ovary, 1 style; 4, vertical section of its 1-seeded fruit; 7, Circæa Lutetiana; 8, the flower enlarged; 9, plan of the flower; 10, vertical section of the 2-celled and 2-seeded fruit.

ANALYSIS OF THE GENERA.

1 Flowers 4 or 5-parted (that is, with 4 sepals, 4 petals, &c.)....2

1 Fls. 3-parted, with no petals. Water plants, lvs. pectinate..PROSERPINÀCA.

1 Fls. 2-parted, complete and regular. Leaves undivided.........CIRCÆ'A. 1

1 Fls. 1-parted, apetalous. Water pls. Lvs. whorled (*Fig.* 226, 5). HIPPÙRIS.

2 Flowers perfect and complete....3

2 Fls. monœcious. Water plants with many-cleft leaves...MYRIOPHYLLUM.

3 Stamens twice as many as the sepals....4

3 Stamens the same number as the sepals..............................LUDWÍGIA.

4 Herbs native of fields, marshes, &c....5

4 Delicate shrubs, cultivated in houses, &c. Flowers crimson...FÙCHSIA.

5 Calyx tube much prolonged above the ovary....6

5 Calyx tube not prolonged above the ovary....7

6 Pod many-seeded, opening by 4 valves. Fls. mostly yellow. ŒNOTHÈRA. 2

6 Pod 1—4-seeded, nut-like, not opening. Fls. white and red......GAURA.

7 Seeds crowned with a tuft of long, silky hairs. Fls. purplish..EPILÒBIUM. 3

7 Seeds not crowned, &c. Flowers large, yellow. Southern.....JUSSIÆ'A. 4

1. CIRCÆ'A. ENCHANTER'S NIGHTSHADE.

Calyx tube a little prolonged above the ovary, lobes 2. Petals 2, obcordate. Stamens 2, opposite the sepals. Fruit reflexed, inversely egg-shaped, with hooked hairs, 2-celled, 2-seeded.—♃ Small, tender herbs, with opposite leaves and terminal racemes of small, reddish-white flowers.

C. LUTETIÀNA. (*See the figure.*) Stem 1—2f high, sparingly branched, pubescent. Leaves dark green, ovate, subcordate, acuminate, coarsely toothed. Pedicels without bracts, bent down after flowering. Fruit clothed with bristly hooks. *June, July.*

C. ALPÌNA. Stem 5—10′ high, very smooth. Leaves pale green, broad cordate, thin, slightly dentate. Common in rocky woods at the North. *July.*

2. ŒNOTHE'RA. EVENING PRIMROSE.

Calyx tube prolonged beyond the ovary, deciduous; segments 4, reflexed. Petals 4, equal, obcordate or obovate, inserted into the top of the calyx tube. Stamens 8. Capsule 4-celled, 4-valved.

Stigma 4-lobed. Seeds not tufted.—Herbs with alternate leaves, and yellow flowers (in all the following species). ***May—Aug.***

1 Flowers opening by night. Pods rounded at the corners, sessile....3
1 Flowers opening by day. Pods club-shaped, sharply 4-cornered....2
2 Stems erect, 1—3 feet high. Flowers large (1—2′ across)....4
2 Stems half-erect, 6—16′ long. Flowers small (5″—8″ across)....6
3 Lvs. slightly toothed. Pods oblong. Fls. 1′ or more wide...Œ. BIÉNNIS.
3 Lvs. sinuate-toothed or pinnatifid. Flowers ½′ wide. *S.*......Œ. SINUÀTA.
4 Pods scarcely winged on the 4 sharp angles. Leaves narrow....5
4 Pods with the 4 angles distinctly winged. Lvs. lanceolate....Œ. FRUTICÒSA.
5 Leaves linear-lanceolate. Fls. finally racemed. *S. M.*........Œ. RIPÀRIA.
5 Leaves linear. Flowers on the ends of the branches. *S. M.*..Œ. LINEÀRIS.
6 Flowers straw-yellow. Pods almost sessile. Common, *N. M*..Œ. PÚMILA.
6 Fls. orange-yellow. Pods distinctly stalked. Rare, *N.-W.*..Œ. CHRYSÁNTHA.

3. EPILO'BIUM. WILLOW-HERB.

Calyx tube not prolonged above the ovary. Limb deeply 4-parted, deciduous. Petals 4. Stamens 8. Stigma often with 4 spreading lobes. Ovary and capsule linear, 4-cornered, 4-celled, 4-valved. Seeds crowned with a tuft of long hairs.—♃ Fls. purplish or white.

E. ANGUSTIFÒLIUM. *Narrow-leaved Willow-herb. Rose-bay.* A tall, showy herb (4—6f high), common at the North. Leaves narrow-lanceolate, nearly entire, with a vein running along the margin. Flowers large, all parts pale purple or white, in a long, terminal spike. Style and stamens declined. Stigma with 4 long lobes. *July, Aug.*—Our four other species, with small flowers, and a club-shaped, undivided pistil, we omit.

4. JUSSIÆ'A.

Calyx tube not prolonged above the ovary, lobes 4—6, persistent. Petals 4—6, stamens twice as many. Stigma capitate, 4—6-grooved. Pod lengthened, 4—6-celled, with very numerous naked seeds.—Showy herbs, with yellow (rarely white) flowers, and alternate leaves, growing in the wet grounds of the South and West.

1 Flowers 5-parted, large. Stems creeping and ascending....2
1 Fls. mostly 6-parted, small. Erect, hairy. Pod slender...J. LEPTOCÁRPA.
1 Fls. 4-parted. Stem erect, winged by the decurrent leaves..J. DECÚRRENS.
2 Plant smooth. Lvs. obtuse, petiolate. Fls. on long pedicels.....J. RÉPENS.
2 Plant hairy. Lvs. acute, subsessile. Fls. on short pedicels..J. GRANDIFLÒRA.

ORDER 60. GROSSULA'CÆ.—CURRANTS.

Small *shrubs*, often prickly, with alternate, lobed, plaited leaves; *flowers* in axillary racemes, regular, 4 or 5-parted, small; *petals* inserted into the throat of the calyx, small, distinct, and the *fruit* a 1-celled, many-seeded, 2-carpeled berry.

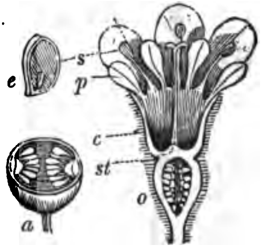


Fig. 227. A flower of the Red Currant cut open; *o*, the ovary and ovules; *st*, the style; *c*, the calyx tube; *p*, the petals; *s*, the stamens; *a*, a berry cut open, showing the two placentæ and seeds; *e*, a seed cut open, showing the little embryo.

RĪBES. CURRANTS AND GOOSEBERRIES.

The character of the genus is about the same as of the Order.

1 Currants. Stems neither prickly nor thorny. Flowers in racemes....2
1 Gooseberries. Sts. pr'kly or thorny (rarely smooth). Fls. scarcely racemed.6
2 Leaves plaited in the bud. Flowers greenish....3
2 Lvs. rolled in the bud. Fls. bright yellow, tubular. Cultivated..R. AURÈUM.
3 Lvs. 5—7-lobed. Racemes erect. Fruit red, nauseous...R. PROSTRÀTUM.
3 Leaves 3—5-lobed, heart-shaped. Racemes drooping.....4
4 Leaves with little yellowish dots beneath. Fruit black....5
4 Leaves downy beneath. Fruit red. Gardens, also wild........R. RÙBRUM.
5 Petioles longer than the leaves. Bracts longer than pedicels. R. FLORÌDUM.
5 Petioles shorter than lvs. Bracts often shorter, &c. Gardens....R. NÌGRUM.
6 Peduncles 1—3-flowered. Leaves roundish, 3—5-lobed....7
6 Peds. 5—9-flwr'd (racemed). Young stems cov'd with prickles. R. LACÚSTRE.
7 Style 2-cleft or 2-parted....8
7 Style undivided, included. Fruit prickly, sweet...........R. CYNÓSBATI.
8 Sta. and sty. exserted (longer than calyx). Fr. smooth...R. ROTUNDIFÒLIUM.
8 Stamens and style not exserted (included).....9
9 Wild plants. Peduncles very short, bractless. Fr. smooth. *N.* R. HIRTÉLLUM.
9 Wild plants. Peduncles long, thread-like. Fr. smooth. *S-W.*..R. GRÁCILE.
9 Garden plants. Peds. with 1-fl. and 2 bracts. Fr. large...R. UVA-CRÍSPA.

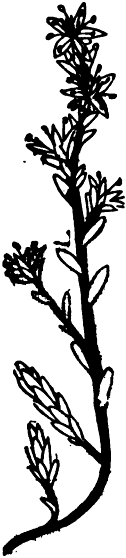


Fig. 228.

ORDER 64. CRASSULA'CEÆ.—HOUSELEEKS.

Thick, juicy *plants*, with simple, mostly entire leaves, with *flowers* perfectly symmetrical and regular, the *petals*, *sepals* and *pistils* being of the same number (3–20), and the *stamens* either the same or twice as many, the *follicles* (as many as the ovaries) distinct or somewhat united.

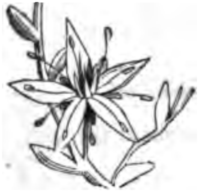


Fig. 229.

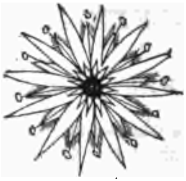


Fig. 230.

Fig. 228, A flowering branch of Sedum acre. Fig. 229, A flower of S. acre, natural size. Fig. 230, A flower, (12-parted, symmetrical, regular) of Sempervivum (Houseleek).

ANALYSIS OF THE GENERA.

1 Pistils (follicles) entirely distinct and separate....2

1 Pistils 4 or 5, united into a 4 or 5-celled capsule....4

2 Stamens twice as many as the pistils, petals or sepals....3

2 Sta. as many (3 or 4) as the pistils, &c. Herb 1—3′ high. *r*.....TILLÆ'A.

3 Flowers 5 (rarely 4)-parted. Stamens 10 or 8. *Stone-crop*......SÈDUM. 1

3 Fls. 12 (or 6—20)-parted. Stamens 12—40. *Houseleek*....SEMPERVÌVUM.

4 ② Herb 2—4′ high, fleshy, with 4-parted flowers. *S*..........DIAMÓRPHA.

4 ♃ Herb 10—16′ high, not fleshy, with 5-parted flowers. *c*....PENTHÒRUM.

1. SE'DUM. STONE-CROP. ORPINE.

Sepals and petals 5, sometimes 4, distinct. Stamens 10 or 8. Pods 5, sometimes 4, distinct, many-seeded, with an entire scale at the base of each.—Mostly ♃ herbs, with 5-parted flowers in cymes, or in one-sided clusters.

1 Flowers white, or purplish, or rose-colored....2
1 Flowers yellow. Plant in low tufts. Gardens. *Irish Moss*.......S. ÁCRE.
2 Leaves scattered, 1—3′ long....3
2 Leaves in whorls of 3s. Fls. white, in a 3-spiked cyme.......S. TERNÀTUM.
3 Lvs. lanceolate or obovate, nearly entire. *M. S*..........S. TELEPHIOÏDES.
3 Lvs. oval, serrate; obtuse. About houses. Fls. purplish...S. TELÈPHIUM.
3 Lvs. linear, numerous. Fls. in an umb. of spikes, purp. *S*..S. PULCHÉLLUM.

ORDER 65. SAXIFRAGA'CEÆ.—SAXIFRAGES.

Herbs or *shrubs* with the pistils fewer than the sepals of the flower; the *petals* as many as the calyx sepals (4 or 5), and together with the 5—10 *stamens* inserted on the calyx, the styles 2, distinct, with their 2 *ovaries* more or less united below, and either free or adhering to cal. *Pods* capsular, many-seeded. *Embryo* slender, in albumen.

ANALYSIS OF THE GENERA.

1 Herbs. Petals imbricate in the bud....2
1 Shrubs. Petals valvate or convolute (twisted) in the bud....6
2 Petals 4—6, generally 5, entire....3
2 Petals 5, all pinnatifid. Stamens 10. *Mitre-wort*...............MITÉLLA. 1
2 Pets. 0. Little prostrate hrbs. in wet places. *Water-carpet*. CHRYSOSPLÈNIUM.
3 Flowers with 10 stamens each....4
3 Flowers with 5 stamens each....5
4 Pods 2-celled. Lvs. simple, mostly radical. *Saxifrage*......SAXÍFRAGA.
4 Pods 2-celled. Leaves biternately compound, cauline. *S*........ASTÍLBE.
4 Pods 1-celled. Leaves palmately lobed. *False Mitre-wort*....TIARÉLLA. 2
5 Styles 2, pod 2-celled. Scape reclined, 8—12′ long. *W*.....SULLIVÁNTIA.
5 Styles 2, pod 1-celled. Scape erect, a foot or more. *M. W*.....HEUCHÈRA.
5 Styles 3, pod 1-celled. Herb in tufts ½′ high. *S*.......LEPUROPÉTALON.
6 Leaves opposite, simple....7
6 Leaves alternate. Shrub 4—8f erect. Racemes white. *M. S*.......ITÈA.
7 Shrub climbing trees, &c. Flowers white, fragrant. *S*....DECUMÀRIA.
7 Shrubs erect. Cymes radiate (§ 255, *a*). Stamens 8—10. HYDRÁNGEA.
7 Shrubs erect. Cymes not radiate—all the fls. perfect...PHILADÉLPHUS. 3

1. MITEL'LA. Mitre-wort.

Calyx 5-cleft, bell-shaped. Petals 5, pinnatifid with linear divisions, inserted on the throat of the calyx. Stamens 5 or 10, included. Styles 2, very short. Capsule short, 2-beaked, 1-celled, 2-valved.—♃ Small, slender herbs, with roundish, lobed and cordate leaves mostly from the root. Flowers small, in a slender raceme. *N.*

1. M. diphýlla. Scape 12—20′ high, with 2 opposite leaves nearly sessile, and many white flowers above with curiously cleft petals. *May*, *June*. (*See Fig.*)

2. M. Nŭda. Scape leafless, thread-like, 5—7′ high, few-flowered. *May*, *June*.

Both species send out runners from the base.

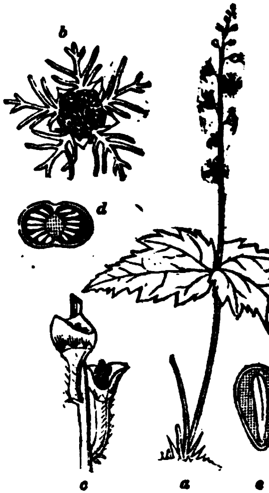


Fig. 231. *a*, Mitilla diphylla; *b*, a flower, magnified; *c*, the fruit pods open, showing the black seeds; *d*, cross section of the ovary; *e*, seed cut open, showing the long embryo.

2. TIAREL'LA. False Mitre-wort. Gem-fruit.

Calyx 5-parted, lobes obtuse. Petals 5, entire, the claws inserted on the calyx. Stamens 10, exserted. Styles 2. Capsule 1-celled, 2-valved, one valve much larger.—♃ Flowers white. *N. M.*

T. Cordifòlia. Scape about 10′ high, sometimes bearing a leaf, the flowers white in all their parts, forming a cylindrical raceme. In rocky woods, with the *Mitre-wort*, very common at the North. *May*, *June*.

3. PHILADEL'PHUS. False Syringa.

Calyx 4—5 parted, tube adherent to the ovary, persistent. Corolla 4—5-petaled. Styles 4, more or less united. Stamens 20—40, shorter than the petals. Capsule 4-celled, 4-valved, many-seeded.—Handsome flowering shrubs, with opposite leaves. Petals convolute in the bud.

1. P. grandiflòrus. *Large-flowered Syringa.* A very showy shrub, 6f high. Leaves ovate, acuminate, 3-veined. Stigmas 4, styles united into 1. Flowers large, in umbels of 2—7, white nearly inodorous. Cultivated, but wild at the South. *June.*

2. P. coronàrius. *Mock-orange.* Stems 5—8f high. Leaves oval and ovate, short-pointed, feather-veined. Styles and stigmas 4, distinct. Flowers numerous, white, handsome, very fragrant. Cultivated. *June.*

ORDER 67. UMBELLIF'ERÆ.—UMBELWORTS.

Herbs with hollow, furrowed stems, simple or compound leaves,
no *stipules*, but with a broad sheathing base to the petioles;
the small *flowers* in umbels, and the *calyx* wholly adherent to the ovary,
the *petals* and *stamens* 5, standing on the top of the ovary;
the *styles* 2, and the *fruit* dry, its 2 carpels seed-like and separating,
marked outside by ribs and furrows running lengthwise.

ANALYSIS OF THE GENERA.

1 Plants growing wild, some of them cultivated for the eatable root....2
1 Plants never wild, but cultivated for their fruit, &c.....18
2 Flowers white, rarely rose-colored or cream-colored....3
2 Flowers yellow, or (in one instance) dark purple....15
3 Umbels simple, leaves simple. Little creeping wet plants....4
3 Umbels regularly compound, the flowers not sessile....6
3 Umbels irregular, flowers in crowded heads, sessile....5
4 Fruit flattened. Lvs. roundish. Fls. sometimes whorled. *c*..**Hydrocòtyle.**
4 Fr. globular. Lvs. linear. Fls. pedicelled. Hight 1—2'. *r*.....**Crántzia.**
5 Fruit clothed with hooked prickles. Heads small, 2—4. *c*....**Sanícula.** 1
5 Fruit clothed with scales. Heads often near 1' thick. *W. S. c*..**Erýngium.**
6 Umbels not radiate (§ 255, *a*, outer flowers not larger than the rest)....7
6 Umbels radiate, very large. Huge herbs, 4—8f high. *c*.....**Herácleum.**
7 Leaves simple linear petioles without blades. *S*..........**Tiedmánnia.**
7 Leaves only once divided, pinnately or ternately....8
7 Leaves twice or thrice compounded....10
8 Fruit flattened or contracted, more or less, on the sides....9
8 Fruit much flattened on the back. Stems 2—5f high. *M S.* ..**Archemòra.**

9 Lfts. 3, ovate, doubly serrate. St. 1—2f high. *Hone-wort*..Cryptotæ'nia. 2
9 Lfts. 3, long, linear, grass-like. Not common. *S*......Neurophýllum.
9 Leaflets 5—11, lanceolate or lance-linear. Stem 2—6f high......Sium.
9 Leaflets 5—9, oblong. Stem procumbent. *S*............Helosciàdium.
10 Bracts of the involucre (not involucel) entire....11
10 Bracts of the involucre cleft and divided 12
10 Bracts of the involucre none or almost none....13
11 Fruits bristly, club-shaped, few. Stem 1—2f high. *Cicely*..Osmorhìza. 3
11 Fruits smooth, flattened on the sides, ribs wavy. Poison.......Conium. 4
11 Fr. smooth, flattened on the back, ribs winged, straight. *r*. Conioselìnum.
11 Fruit smooth, terete, not flattened, ribs straight. *Lovage*...Ligústicum.
12 Fruits bristly, short, numerous. Often cultivated. *Carrot*.......Dáucus.
12 Fruits smooth. Stems and leaflets thread-like. *Rare*......Discopleùra.
12 Fruits smooth. Stem 3—6′ erect, bulbous at base. *W*.........Erigenìa.
13 Fruit flattened on the back. Stems thick and tall. *c*....Archangélica.
13 Fruit flattened on the sides....14
13 Fruit terete, not flattened. Fœtid and poison. *N. Rare*.......Æthùsa.
14 Cal. 5-toothed. Umbs. often sessile. Sts. diffuse, slend. *W*. Chærophýllum.
14 Cal. 5-toothed. Umbels stalked. Sts. erect, very slender.. *S*. Leptocaùlis.
14 Cal. teeth none, fruit strongly ribbed. Poison. *Common*.........Cicùta. 5
14 Calyx teeth none, fruit scarcely ribbed. *W. Rare*.............Eùlophus.
15 Fruit decidedly flattened on the back....17
15 Fruit flattened on the sides or not at all....16
16 Involucels leafy. Lvs. perfoliate, simple, entire. *Modesty*....Buplèurum.
16 Involucels minute. Seed with 5 winged ribs................Tháspium. 6
16 Involucels minute. Seed with 5 ribs not winged................Zízia. 7
17 Involucels minute. Fruit corky. Leaves bipinnatifid....Polytæ'nia.
17 Involucels none. Fruit thin. Lvs. pinnate. *Parsnip*.......Pastinàca.
18 Flowers white. Involucre 0 or of 1 entire bract....19
18 Flowers white. Involucre of a few cleft bracts. *Parsley*...Petroselìnum.
18 Fls. yellow. Lf. segments very narrow and many. *Fennel*..Fœnìculum.
19 Umbellets radiate. Fr. round. Lvs. finely cut. *Coriander*..Coriándrum.
19 Umbellets not radiate (the flowers all similar)....20
20 Fr. flattened on the sides, roundish. Lf. segs. wedge-form. *Celery*..Apium.
20 Fr. flattened on the sides, oval. Lf. segments linear. *Caraway*...Càrum.
20 Fr. egg-shaped, not flattened. Lf. segments linear. *Anise*...Pimpinélla.

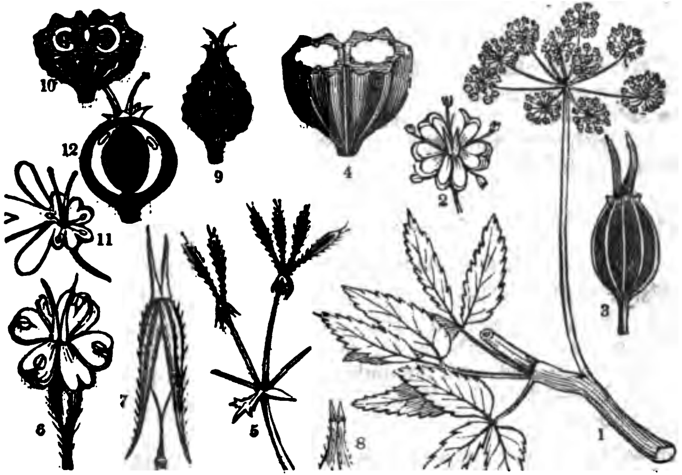


Fig. 232. 1, Zizia aurea, with its compound, naked umbel, &c. 2, A flower enlarged. 3, The fruit with its filiform ribs and two persistent styles. 4, Cross section, showing the two carpels with the vittæ and flat inner face. 5, Umbel of Osmorhiza longistylis in fruit. 6, A flower enlarged. 7, The fruit with the two carpels separating from the base and supported by a two-cleft stalk. 8, Summit of the fruit of O. brevistylis. 9, Fruit of Poison Hemlock, with the undulate-crenulate ribs. 10, Cross section, showing the grooved inner face and involute albumen. 11, Radiate flower of Coriandrum. 12, Vertical section of the globose fruit, showing the minute embryo.

1. SANIC′ULA. Sanicle.

Flowers polygamous. Calyx teeth leafy, tube bristly. Petals obovate, erect, with the point inflected. Fruit roundish, armed with hooked prickles. Carpels without ribs.—♃ Umbel with a few capitate umbellets. Involucre of few cleft bracts, involucel of several, entire.

S. Marilándica. Stem 1—2f high, forked, smooth, furrowed. Radical leaves on long petioles, blade 3-parted to the base with the lateral segments 2-parted. Cauline leaves few, nearly sessile, segments oblong, cut-serrate. Involucres 6-leaved. Heads small, 2—4. Flowers mostly barren, greenish. In woods. *June.*

2. CRYPTOTÆ'NIA. Hone-wort.

Calyx teeth obsolete. Petals with an inflexed point. Fruit linear-oblong or ovate-oblong. Seeds with 5 obtuse ribs, contracted at the sides.—♃ A smooth herb with 3-parted leaves. Umbels compound, with very unequal rays, white flowers, no involucre, and few-leaved involucels.

C. **Canadénsis.** St. 1—2f high, erect. Leaflets large, the side ones often 2-parted or lobed. Common in moist woods. *July.*

3. OSMORHI'ZA. Sweet Cicely.

Calyx teeth obsolete. Fruit linear-oblong, club-shaped, tapering to the base, crowned with the conical styles, carpels each with 5 equal, acute, bristly ribs, and a deep groove on the face.—♃ Leaves biternately divided, with the umbels opposite. Involucre few-leaved, involucel 4—7-leaved. Flowers white. Fruit an inch in length. Hight about 2f.

Stys. thread-like, nearly as long as ovary. Plant downy. *N.M.* O. **longístylis.**
Styles conical, 5 times shorter than ovary. Plant hairy. *N.M.*. O. **brevístylis.**

4. CONI'UM. Poison Hemlock.

Calyx teeth obsolete. Fruit ovate, flattened on the sides, each carpel with 5 wavy-crenulate ribs on the back, and a deep narrow groove on the inner face.—② Herbs with large, decompound leaves, with very many leaflets. Involucre and involucels of 3—5 leaves, the latter one-sided. Flowers white.

C. **maculàtum.** Stem spotted with purple, glaucous, about 4f high. Leaves bright green, leaflets small, lanceolate, pinnatifid. Umbels terminal, the involucels with the inner half wanting. *June, July.*

5. CICU'TA. Water Hemlock.

Calyx 5-toothed. Petals with the point inflected. Fruit roundish, a little contracted on the sides so as to appear somewhat double. Seeds with 5, flattish, equal ribs, 2 of them on the margin.—♃ Poisonous herbs with compound leaves and perfect umbels of white flowers. Involucre few-leaved or 0. Involucels many-leaved.

1. C. MACULÀTA. *Spotted Water-Hemlock.* Stem streaked with purple, 3—6f high, smooth, striate, hollow. Lower leaves triternate and tripinnate, segments lanceolate, serrate. Umbels 2′—4′ broad. Fruit 10-ribbed. Involucels of 5 or 6 short, slender, acute bracts. Common in wet meadows. *July, Aug.*

2. C. BULBÍFERA. *Narrow-leaved Water-Hemlock.* Stem green, striate, slender, with little bulblets in the axils of the branches. Leaves biternately divided. Leaflets linear or lance-linear, 2′—4′ long, with distant teeth. In wet meadows and swamps. *Aug.*

6. THAS'PIUM.

Calyx minutely 5-toothed. Fruit elliptical, roundish across, not flattened either way, seeds each with 5 winged ribs.—♃ Leaves divided. Involucre none, involucels few-leaved. The species resemble the *Zizias* except in their fruit. *May—June.*

1 Root leaves simple, cordate, stem leaves once-ternately divided....2
1 Lvs. bi- or tri-ternate, lfts. cut-serrate. St. hairy at joints...T. BARBINÒDE.
2 Fruit oval. Flowers yellow. Stem 2—3f high.................T. AÙREUM.
2 Fr. roundish. Fls. dark purple. Stem 2—3f high. *S. M.*.T. ATROPURPÙREUM.

7. ZIZ'IA. GOLDEN ALEXANDERS.

Calyx minutely 5-toothed. Fruit oval or ovate, flattened at the sides so as to appear somewhat double. Seeds each with 5 ribs which are not winged, but thread-like.—♃ Smooth, with divided leaves and yellow flowers. Umbels compound, with no involucre and few-leaved involucels. *May—June.*

Root leaves simple, cordate; stem leaves ternate, all serrate.....Z. CORDÀTA.
Root leaves once-ternate, upper leaves bi-ternate, all serrate........Z. AÙREA.
Root and stem leaves bi- and tri-ternate, leaflets entire.......Z. INTEGÉRRIMA.

ORDER 69. CORNA'CEÆ.—CORNELS.

Trees and *shrubs*, seldom *herbs*, with simple, mostly opposite leaves, with *flowers* 4-parted, arranged in cymes, the 4 *petals* valvate in the bud, and with the 4 *stamens* standing on the top of the 2-celled *ovary*, which is adherent to the calyx tube. *Styles* united, *fruit* a 2-celled drupe.

CORNUS. Cornel. Dogwood.

Characters of the genus indicated in that of the Order.

1 Flowers in cymes with no involucre. Shrubs. (7 species—omitted.)
1 Flowers in close clusters surrounded by a 4-leaved white involucre....2
2 A small tree (20—30f). Invol. 3′ broad, very showy. Lvs. ovate..C. FLORIDA.
2 A sm. herb (3′—5′ high). Invol. 1′ broad. Lvs. 6 (and 4). *N.M.*.C. CANADÉNSIS.

CHAPTER II.

OF THE MONOPETALOUS EXOGENS.

Essential Character.—Flowering plants (PHÆNOGAMIA) with their stems growing by additions to the outside in layers (EXOGENS), their seeds inclosed in a seed-vessel or pericarp (ANGIOSPERMS), their flowers with a double perianth and their petals united (MONOPETALÆ).

ORDER 71. CAPRIFOLIACEÆ.—HONEYSUCKLES.

Shrubs and *herbs*, often twining, with opposite leaves,
with *flowers* clustered and often fragrant, 5-parted and often irregular,
corolla monopetalous, tubular or rotate,
stamens inserted on the tube of the corolla often one less than its lobes; *ovary* adherent to the calyx, *style* 1, *fruit* a berry, drupe or capsule; *embryo* small, in fleshy albumen.

ANALYSIS OF THE GENERA.

1 Corolla tubular. Stigma capitate, on a slender style....2
1 Corolla rotate, deeply 5-lobed. Stigmas 3, rarely 5, sessile. Shrubs....5
  2 Herbs....3
  2 Shrubs....4

3 Stamens 4, capsule 3-celled. A trailing evergreen. *Twin-fl.*.....LINNÆ'A. 1
3 Sta. 5, drupe bony, 3—5-celled. Erect, unbranched. *Fever-root.* TRIÓSTEUM.
4 Cor. bell-shaped, reg'r. Berry glob., 4-celled, 2-seeded..SYMPHORICÁRPUS. 2
4 Cor. tubular, lobes unequal. Berry 2—3-celled, few-seeded. *c*..LONICÉRA. 3
4 Corolla funnel-shaped. Capsule 2-celled, many-seeded. *c*....DIERVÍLLA. 4
5 Leaves pinnate. Berry globose, pulpy, 3-seeded. *c*............SAMBÚCUS. 5
5 Leaves simple. Drupe flattish, one-seeded. *c*.................VIBÚRNUM.

1. LINNÆ'A. TWIN-FLOWER.

Calyx tube ovate, limb 5-parted, deciduous, with 2 bractlets at base. Corolla bell-shaped, limb a little irregular, 5-lobed. Stamens 4, 2 longer than the other 2. Capsule 3-celled, but only 1-seeded, 2 of the cells being empty.—A trailing evergreen herb, dedicated to Linnæus, the first and greatest of botanists.

L. BOREÀLIS. The only species, a fine little plant, found in moist woods in cool climates. It has long, thread-like, creeping stems, rooting at the joints, the upright branches about 3′ high. Leaves small, roundish. Flowers in pairs, rose-colored, nodding, at the top of the slender stalk. *June.*

2. SYMPHORICAR'PUS. SNOW-BERRY.

Calyx tube globose, limb 4—5-toothed. Corolla bell-shaped, 4—5-lobed, regular. Stamens 4—5, short. Fruit a globose berry, 4-celled but only 2-seeded, 2 cells being empty.—Small erect shrubs with oval, entire leaves, rose-white flowers in short clusters.

1 Stamens and style included (i. e. not longer than the corolla)....2
1 Stamens and bearded style exserted (extending out of the corolla)....3
2 Fls. in loose, leafy racemes. Berries snow-white, large. *Cult.*..S. RACEMÒSUS.
2 Fls. in dense, nodding spikes. Ber'es white. *Wolf-berry. N-W.* S. OCCIDENTÀLIS.
3 Flowers in axillary heads. Berries red. *Coral-berry. M.S.W.*..S. VULGÀRIS.

3. LONICE'RA. HONEYSUCKLE.

Calyx tube globular, limb 5-toothed, very short. Corolla tubular or funnel-form, limb 5-cleft, irregular or almost regular. Stamens 5. Ovary 2 or 3-celled. Berry few-seeded.—Climbing or erect shrubs, with opposite and often connate leaves (that is, their bases growing together around the stem), entire on the margins.

1 Stem climbing, flowers sessile, whorled (in pairs in one species)....2
1 Stem mostly erect, leaves never connate, flowers in pairs....8
2 Upper pair or pairs of leaves united (connate) at base....3
2 Leaves all distinct, corolla ringent. (In gardens only.)....7
3 Corolla tube gibbous (swelled out on one side) at base, limb ringent....6
3 Corolla tube equal and slender (not gibbous) at the base....4
4 Corolla ringent, lower lip linear, upper 4-lobed....5
4 Corolla trumpet-shaped, nearly regular, scarlet...........L. sempervìrens.
5 Fls. in a terminal, 2 (or more)-whorled spike, bright yellow.....L. flava.
5 Flowers in terminal and axillary whorls, reddish white.........L. grata.
5 Fls. in a single, terminal whorl, red, yellow and white....L. caprifòlium.
6 Lvs. oblong, smooth and glauc. beneath. Fls. 1′ long, yellow. .L. parviflòra.
6 Lvs. broad-oval, hairy and downy, green. Fls. sulphur-yellow...L. hirsùta.
7 Fls. whorled, capitate, red and yel'w. Lvs. deciduous..L. Periclýmenum.
7 Fls. in pairs, axillary and terminal. Leaves evergreen......L. Japónicum.
8 Cor. gibbous at base, lobes more or less irregular. Wild....9
8 Cor. not gibbous, lobes spread., equal. Lvs. cordate, obtuse.† L. Tartáricum.
9 Cor. lobes short, erect, nearly equal. Berries red.............L. ciliàta.
9 Cor. deeply ringent. Peds. long. Berries double, purple. L. oblongifòlia.
9 Cor. deeply ringent. Peds. very short. Berries double, blue. L. cœrùlea.

4. DIERVIL'LA. Bush Honeysuckle.

Calyx tube oblong, limb 5-cleft, corolla twice as long, limb 5-cleft and nearly regular. Stamens 5. Capsular fruit 2-celled, many-seeded.—Small erect shrubs with opposite leaves and axillary flowers.

D. trífida. Stem about 2f high, branching. Leaves ovate, serrate, ending in a long narrow point. Peduncles 1—3-flowered, the ovaries slender, about half as long as the greenish-yellow corolla. Hedges and woods. *June.*

5. SAMBU'CUS. Elder.

Calyx small, 5-parted. Corolla regular, rotate, 5-cleft into obtuse lobes. Stamens 5. Stigmas sessile. Berry globose, pulpy, 3-seeded. —Shrubs (5—6f high) or perennial herbs with pinnate or bipinnate leaves. Flowers (white) in cymes.

Lvs. nearly 2-pinnate. Cymes flat. Ber. dark-purp. *Sweet. June.* S. Canadénsis.
Lvs. once-pinnate. Cymes oblong, panicled. Ber. red. *Red. May*...S. pùbens.

ORDER 72. RUBIA'CEÆ.—MADDERWORTS.

Plants with opposite (sometimes whorled) entire *leaves*, the *stipules* between the petioles, the *calyx* adherent to the ovary (often not so), the *corolla* regular, the *stamens* (3—5) on the corolla and as many as its lobes, the *fruit* various and *seeds* with abundant albumen.

ANALYSIS OF THE GENERA.

1 Plants not found (unless cultivated) north of Florida (9 genera omitted.)
1 Plants native in the Northern, Southern, Middle or Western States....2
2 Ovary (inferior) adherent to the calyx tube....3
2 Ovary (superior) free from the calyx. Herbs with opposite leaves....6
3 Leaves opposite, with small stipules between the petioles....4
3 Leaves whorled. Herbs slender, with square stems. *Clivers*...GÀLIUM.
4 Herb creeping, with twin flowers and double red berries......MITCHÉLLA. 1
4 Herbs with the flowers and ovaries single....5
4 Shrubs 6f high, with the fls. in globose heads. *Button-bush.* CEPHALÁNTHUS.
4 Tree small, with small cymes of large tubular, purplish fls. *S.* PINCKNÉYA.
5 Capsule 2-celled, many-seeded. Flowers 4-parted...........HEDÝOTIS. 2
5 Carps. 2, 1-seeded, separat., one open, the other closed. *W.S.* SPERMACÒCE.
5 Carpels 2, 1-seeded, separating, neither of them opening. *W. S.*...DIÒDIA.
6 Fls. 4-parted, very small, white. Lvs. linear-awl-shaped. *S.*.POLYPRÉMUM.
6 Flowers 5-parted, small, white, in terminal coiled racemes. *S.*..MITRÉOLA. 3
6 Fls. 5-parted, large (2′ long), scarlet, tubular. *Pink-root. W. S.*...SPIGÉLIA.

1. MITCHEL'LA. PARTRIDGE-BERRY.

Flowers 2 on each double ovary. Calyx 4-parted. Corolla funnel-shaped, hairy within. Stamens 4, short, inserted on the corolla. Stigmas 4. Berries composed of the 2 united ovaries.—Smooth, trailing, evergreen herbs. Lvs. round-ovate, petiolate with minute stipules. Flowers white or rose-white. Berries bright red.

M. RÈPENS. Common in woods, everywhere. Stems a foot or so in length. Flowers in June, fragrant. Berries remaining through the winter.

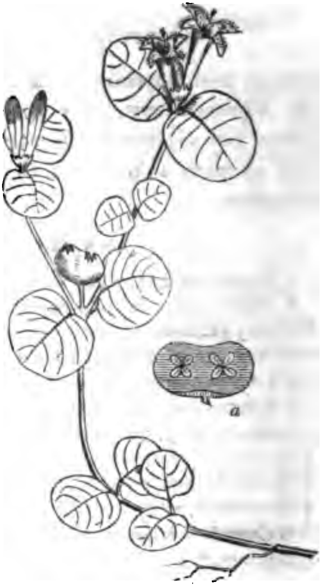


Fig. 233. Mitchella repens, whole plant, with flowers and fruit. *a*, cross section of the double fruit, showing the two ovaries.

2. HEDY'OTIS.

DWARF-PINK. BLUETS.

Calyx tube ovate, limb 4-parted, corolla 4-lobed. Stamens 4, inserted on the corolla. Stigma 2-lobed. Capsule 2-celled, many-seeded.—Small herbs (rarely shrubs) with opposite leaves and small stipules united to the petiole.

1 Corolla salver-form. Plants very delicate, the peduncles 1-flowered....2
1 Corolla funnel-form. Flowers in little cymes. Leaves near 1′ long....5
1 Corolla wheel-shaped, much shorter than the calyx. Fls. axillary....7
2 Stems erect, forked. Leaves spatulate, tapering to the slender base....3
2 Stems creeping. Leaves roundish, abrupt at base, on short stalks....4
3 Plant 1′—3′ high. Peduncles mostly shorter than the leaves...H. MÍNIMA.
3 Plant 3′—7′ high. Peduncles much longer than the leaves..H. CŒRULÈA.
4 Peduncles terminal, 1′—2′ long. Leaves round-ovate....H. SERPYLLIFÒLIA.
4 Peduncles axillary mostly, shorter than the round-oval lvs. H. ROTUNDIFÒLIA.
5 Leaves narrow, lance-linear, with one visible vein....6
5 Lvs. lance-ovate, 3—5-veined. Fls. white (or purple). *W*....H. PURPURÈA.
6 Stem 4′—6′ high. Lvs. mostly radical, obtuse. *M. W*.........H. CILIOLÀTA.
6 Stem 5′—10′ high. Lvs. cauline, acute at each end. *N-W*...H. LONGIFÒLIA.
6 St. 1—2f high. Lvs. very narrow-lin. Caps. top-shaped. *S. W.* H. STENOPHÝLLA.
7 Leaves linear, 1′ long. Calyx teeth spreading on the fruit. *S*..H. BÓSCII.
7 Leaves lance-oblong. Calyx teeth erect on the fruit. *M.S.*.H. GLOMERÀTA.

3. MITRE'OLA. False Mitrewort. Southern Mitrewort.

Calyx 5-parted. Corolla between urn- and funnel-shaped, throat bearded, limb 5-lobed. Stamens 5, included. Styles 2, separate at base, united above. Capsule more than half superior, 2-horned, mitre-shaped.—① Smooth. Stems 1—2f high. Leaves opposite. Fls. small, white, in terminal racemes which uncoil as they blossom. *S.*

Leaves lance-oval, petiolate, 1′—3′ long .... M. PETIOLATA.
Leaves round-ovate, sessile, ½′—1′ long .... M. SESSILIFÓLIA.

ORDER 75. COMPOSITÆ.—ASTERWORTS.

An immense family of *herbs* or *shrubby plants*, with *compound flowers*, that is, the *flowers* (or *florets*) collected into close *heads* upon a common receptacle, and surrounded by an *involucre* of many bracts (called *scales*), with 5 *stamens* which have their anthers united into a tube around the style, with the *calyx tube* closely adhering to the 1-celled ovary (an achenium in fruit), and the *calyx limb* crowning the ovary in the form of a *pappus* consisting of scales, awns, bristles or hairs, or else entirely wanting; the *corolla* consisting of 5 united petals, either strap-shaped (ligulate) or tubular, and the *style* 2-cleft at the top.

In this Order the pupil will remember that the *heads* are called *radiate*, when the outer florets only have *rays* or are *ligulate* (see the figure 234, 1), *radiant*, when all the florets are ligulate (figure 7), *discoid*, when all the florets are tubular, there being no rays (fig. 12). The *receptacle* is the broad top of the stalk on which the florets sit (fig. 2). It is *chaffy* when there are scales or bracts growing among the florets, and *naked* when there are no such scales.

The tubular florets constitute the *disk*, and the ligulate, if any, the *ray;* the disk is generally *yellow*, while the ray is about as often *cyanic* (that is, blue, red, white, or *any* color except yellow) as yellow.

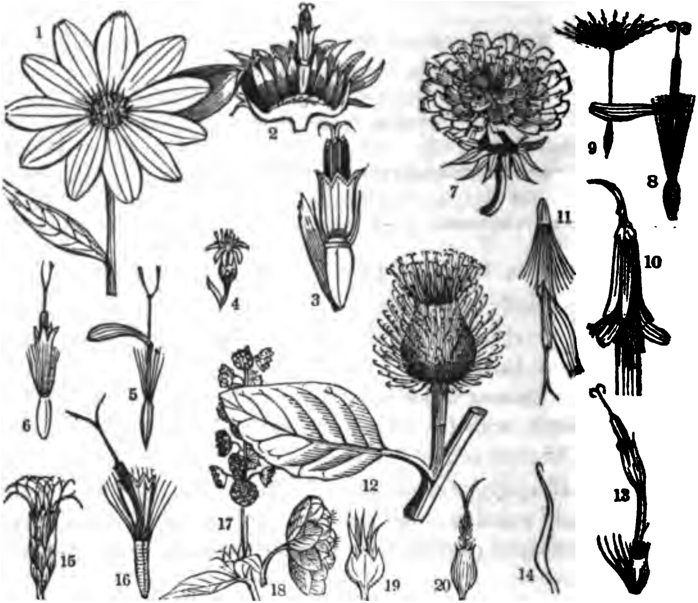


Fig. 234. 1. Helianthus strumosus—head radiate. 2. Vertical section of the head, showing the scales of the involucre, and a single disk-flower remaining upon the convex receptacle. 3. A perfect disk-flower magnified, showing the achenium, the 2 awns of the pappus, the 5-toothed tubular corolla, the 5 stamens united around the branched style, and the chaff-scale at base. 4. Head (radiate) of Solidago cæsia. 5. A pistillate, ligulate flower of the ray. 6. A perfect disk-flower. 7. A (radiant) head of Taraxacum Dens-leonis. 8. A perfect, ligulate fl. 9. Achenium, with its long beak and feathery pappus. 10. A (radiant) head of Nabalus altissimus. 11. A flower. 12. Lappa (Burdock), head discoid. 13. A flower. 14. One of the hooked scales. 15. A (discoid) head of Eupatorium purpureum. 16. A flower. 17. Ambrosia (Pig-weed). 18. Staminate head enlarged. 19. Pistillate involucre enlarged. 20. The fertile flw'r.

ANALYSIS OF ALL THE GENERA IN THE UNITED STATES

(*Except those with discoid heads.*)

1 Heads of florets discoid (no rays)....(many genera, but all omitted.)

1 Heads radiate, with yellow rays....2

1 Heads radiate, with cyanic rays....3

1 Hds. radiant, florets all ligulate and perfect. Plants with a milky juice. 4

2 Leaves alternate or scattered on the leafy stems....8
2 Leaves opposite or whorled on the stems, or all radical....10
3 Leaves alternate or scattered on the leafy stem....11
3 Leaves opposite or whorled on the leafy stem....35
3 Leaves all radical and the flowers on a scape....36
4 Flowers bright yellow....5
4 Flowers white, cream-color or purplish....7
4 Flowers blue. Stems leafy, erect....41
5 Pappus none. Involucre of about 8 equal scales....37
5 Pappus double, the outer of scales, inner of bristles....38
5 Pappus wholly of hair-like bristles, generally abundant....6
6 Fruit bearing the pappus on its slender beak....39
6 Fruit not lengthened into a beak, pappus sessile....40
7 Pappus consisting of equal, feather-like bristles....42
7 Pappus of simple, hair-like bristles, abundant....43
8 Receptacle chaffy (with bracts growing among the florets)....9
8 Receptacle with deep, horny cells, like a honey-comb....19
8 Receptacle not chaffy, flat or merely convex....15
8 Receptacle not chaffy, conical or globular....20
9 Rays sterile, disk fertile. Receptacle conical or columnar....21
9 Rays sterile, disk fertile. Recp. flattish. Fr. flattened on the sides....22
9 Rays fertile, disk sterile. Rcp. flat. Fr. flattened same way as scales....23
10 Receptacle chaffy. Rays sterile, disk fertile....26
10 Receptacle chaffy. Rays fertile, disk sterile....27
10 Receptacle chaffy. Rays fertile, disk perfect....28
10 Receptacle naked or destitute of chaffy scales....24
11 Receptacle not chaffy, naked of scales....12
11 Receptacle chaffy with scales among the florets. Lvs. finely divided....33
11 Receptacle chaffy with scales, &c. Lvs. undivided, merely toothed....34
12 Pappus of numerous bristly hairs....13
12 Pappus of 2 or 3 awns and minute hairs. Glabrous plants....31
12 Pappus wholly wanting, or only a membranous margin....32
13 Involucre of unequal scales, imbricated in several rows....14
13 Involucre scales nearly equal, narrow, and almost in one row....31
14 Pappus simple, the bristly hairs abundant and about equal....29
14 Pappus double, the outer row of hairs extremely short....30

15 Involucre scales imbricated in several rows....16
15 Involucre not imbricated, the outer scales very short or none..Senècio.
15 Invol. not imbr., outer scales equal to the inner. *Marigold.* Calèndula.
15 Involucre not imbricated, outer scales longer than inner. *S.*.Gaillàrdia.
16 Pappus simple, the bristles all equal and of one kind....17
16 Pap. d'ble, the outer very short and chaffy. Lvs. entire. *W.S.* Chrysópsis.
16 Pap. double in the disk, none in the rays. Lvs. toothed. *S.* Heterothèca.
17 Heads small, rays few (2—15)....18
17 Heads quite large, rays narrow, about 30. Tall. *Elecampane. c.*.In'ula.
18 Pap. scaly, very short. Root lvs. cordate. Rays 4 or 5. *S.* Brachychæ'ta.
18 Pap. abundant bristly hairs. Rt. lvs. not cordate. Pedicels short. Solidàgo. 1
18 Pap. of a single row of equal bristly hrs. Ped'cls long, slender. *S.* Isopáppus.
19 Involucre about 4-rowed. Rays 20—30. Head solitary. *S.*.Baldwínia.
19 Invol. about 2-rowed. Rays 8—10. Hds. corymbed. *S.* Actinospérmum.
20 Ray florets pistillate. Leaves decurrent. *Sneezwort*..........Helènium.
20 Ray florets neutral. *False Sneezwort*......................Leptòpoda.
21 Fruit (achenia) 4-angled. Heads large, showy. *Cone-flower.* Rudbíckia.
21 Fruit flattened, winged. Heads showy. Rays droop. *W. S.* Lépachys.
22 Achenia wingless. Pappus of 2 deciduous scales. *Sun-flower.* Heliánthus. 2
22 Ach. winged. Pappus of 2 persist. awns. Lvs. often decurrent. Actinómeris.
23 Ach. wingless, in more than 1 row. Coarse pls. with large hds. Sílphium.
23 Ach. winged, in only 1 row. Small, with middling hds. *S.* Berlandièra.
24 Stems leafy, erect, about 2f (or 1—3f) high....25
24 Stemless plants, lvs. radical, appearing after heads. *Colts-foot.* Tussilàgo.
25 Scales 5, united in 1 row. Leaves pinnate. *French Marigold*..Tagètes.
25 Scales in 2 rows, the outer united. Leaves pinnate. *W. S.*...Dysòdia.
25 Scales in 1 or 2 rows, all distinct. *W. S.*....................Ar'nica.
26 Invol. imbricated in 3 or more rows of scales. *Sun-flower*...Heliánthus. 2
26 Invol. 2-rowed. Pappus of downwardly hispid awns. *Burr Marigold.* Bìdens. 3
26 Invol. 2-rowed. Pap. upwardly hispid if at all. *Tick Sun-flower.* Coreópsis. 4
27 Ach. wingless. Rays 5—12. Herbs viscid, 2—10f high. *S.*...Polýmnia.
27 Ach. wingless. Rays 5. Hbs. 2′—10′ high, at first stemless. *W.S.* Chrysógonum.
27 Ach. broadly winged. Rays 12—25. Coarse, tall hbs. *S-W.M.* Sílphium.
28 Herbs 3—6f high. Rays 1—5. Receptacle flat. *S-W.*......Verbesìna.
28 Herbs 2—3f high. Rays 6—9. Receptacle convex. *S-W.* Tetragonothèca.

28 Hbs. 2—6f high. Rays 10—15. Recep. conical. *False Sun-flower*. Heliópsis.
28 Shrubs 3—10f high, with solitary heads. *S.*..................Borríchia.
29 Ach. very silky, biggest at top. Rays about 5. *False Aster*. Sericocárpus.
29 Achenia smooth or smoothish, flattened. Rays 6—100. *Starwort*..A'ster. 5
30 Wild plts. 1—4f high, with middle sized hds. (about 1′ broad). Diplopáppus.
30 Garden plants 1—2f high, with very large hds. *China Aster*. Callístephus.
31 Herbs 2—3f high, very smooth. Leaves lanceolate, entire...Boltònia.
31 Hbs. ½—9f high, hairy or rough. Rays 20—200. *White-weed*..Erígeron. 6
32 Invol. broad and flattish. Pappus 0. Wild plts. Rays white. Leucánthemum.
32 Invol. hemispherical. Pappus a membranous margin. *Cult.*..Pyrèthrum.
32 Invol. hemispherical. Pappus 0. Lvs. lobed. *Cultivated*. Chrysánthemum.
32 Invo. bell-shaped. Pap. 0. Lvs. spat., entire. Rays violet-purp. *W. Daisy*. Béllis.
33 Disk florets yellow, perfect. Rays pistillate. *Camomile*....Anthémis.
33 Disk florets yellow, perfect. Rays neutral. *May-weed*........Marùta.
33 Disk florets white, perfect. Rays pistillate. *Yarrow*.......Achillèa. 7
34 Rays short, white, 3 or 4. *W. S. Crown-beard*................Verbesìna.
34 Rays very short, white, 5, ear-shaped. *W. M*..........*..Parthènium.
34 Rays very large, purple, pendulous. *Purple Cone-flower*......Echinàcea.
35 Leaves pinnately divided. Inner involucre of 8 united scales.† Dáhlia.
35 Leaves simple. Receptacle conical with large chaff.†.........Zínnia.
35 Lvs. simple. Receptacle flat. Rays rose-color. *Tick-seed*...Coreópsis. 4
35 Lvs. simple. Receptacle flat. Rays white, short. *W.*........Eclípta.
36 Heads in corymbs. Disk florets regularly 5-toothed. *r.*......Nardósmia.
36 Heads solitary. Disk florets regularly 5-toothed. *S.*............Béllis.
36 Hds. solitary. Disk flts. 2-lipped, outer lip 3-toothed, inner 2. *S.* Chaptàlia.
37 Leaves all alternate. Heads panicled. *r.*..................Lampsàna.
37 Leaves partly opposite. Heads solitary or umbeled. *S.*.......Apògon.
38 Lvs. all rad'l., pinnatifid-toothed. Pap. scales 5, with 5 bristles. *c.* Krígia.
38 Lvs. all or mostly rad., seldom pinn. Pap. scales and bristles many. Cýnthia.
39 Stemless leaves runcinate. Pappus white. *Dandelion*....Taráxacum. 8
39 Stems leafy or not. Pappus reddish or tawny. *S.*.....Pyrrhopáppus.
39 Stems leafy, leaves runcinate. Pappus silky-white. *c.*.......Lactùca.
40 Pappus brownish. Stems mostly leafy, with many heads. *c.*..Hieràcium. 9
40 Pappus silky white. Stemless; scapes each with one head. *W.* Tróximon.
40 Pappus silky white. Stems bearing prickly leaves. *c.*..........Sónchus.

41 Pappus of many small scales. Branched stems 2f high. *c. E.* CICHÒRIUM.
41 Pappus of many hair-like bristles. Sts. 3—8f high. *W.S.M.* MULGÈDIUM.
42 Leaves on the stem linear, entire. Flowers purplish.† . . . . . TRAGOPÒGON.
42 Lvs. all radical, toothed. Flowers white. Fruit taper-beaked. LEÓNTODON.
43 Achenia with a long beak, pappus silk-white. Heads erect. *c.* LACTÙCA.
43 Ach. not beaked, pappus dull-white. Hds. mostly nodding. *c.* . . . NÁBALUS. 10
43 Ach. not beaked, pap. dull-white. Hds. erect, purple. *S. r.* LYGODÉSMIA.

1. SOLIDA'GO. GOLDENROD.

Heads few-flowered, the rays 1—15, pistillate, disk-florets perfect. Involucre oblong, imbricate, with close-pressed scales. Receptacle alveolate, narrow. Pappus simple, of equal, hair-like, rough bristles. —Herbs very abundant in the United States. Stem erect, branching near the top. Leaves alternate. Heads small, florets all yellow (in S. BICOLOR whitish,) opening from August to October.

1 Shrub woody, 1—3f high. Hds. with 1—3 rays. *S.* 29
1 Herbs. Heads without rays (discoid) . . . . *S.* 13
1 Herbs. Heads with rays (1—15, generally small) 2
2 Scales of the involucre with recurved, leafy, green tips 14
2 Scales of the involucre erect, tips scarcely at all green 3
3 Heads (white or yellow) in axillary, close clusters or short racemes 15
3 Heads in terminal racemes forming a close or a spreading panicle 4
3 Heads in terminal compound corymbs 12
4 Racemes erect, not one-sided. Leaves feather-veined 5
4 Racemes spreading or recurved, the flowers all on one side 7
5 Alpine species (growing only on mountains). Heads quite large 16
5 Not alpine—growing in plains or low grounds. Heads not large 6
6 Plants very smooth, at least the stem and leaves. Rays 4—7 17
6 Plants downy or hoary with very close soft hairs. Rays 9—12 18
7 Leaves all very entire, smooth and fleshy 21
7 Leaves serrate or serrulate, sharply or bluntly 8
8 Leaves distinctly 3-veined, narrow-lanceolate 9
8 Leaves feather-veined, and sometimes obscurely 3-veined 10
9 Stem downy or hairy, roughish 22
9 Stem smooth and glabrous, often glaucous 23
10 Stem downy or hairy, rough or grayish. Leaves rough or not 28
10 Stem smooth and glabrous. Leaves smooth or rough 11
11 Rays 6—12. Racemes close, forming a compact panicle 24
11 Rays 6—12. Racemes distant, loosely or scarcely panicled 26
11 Rays 2—5. Racemes, or the panicle, long and slender 27

12 Leaves lanceolote, large. Stem smooth....19
12 Leaves lanceolate, large. Stem rough-downy....20
12 Leaves linear, entire. Stems much branched, smoothish....29
13 Disk florets 10—15. Racemes erect, panicle slender.......S. DISCOÌDEA.
13 Disk flts. 5—7. Rac. spreading, one-sided, pan. slend. *S.* S. BRACHYPHÝLLA.
14 Rays 12—15. St. smooth below. Rt. lvs. broad, oval, petiol. *N.M.* S. SQUARRÒSA.
14 Rays 9—11. Stem finely downy. Root lvs. small, sessile. *S.*..S. PETIOLÀRIS.
15 Plant hairy, with (mostly) white heads and lance-oblong lvs..S. BÍCOLOR.
15 Plant smoothish, with large, broad-lanceolate leaves.......S. LATIFÒLIA.
15 Plant smooth and glabrous, tall and slender. Lvs. lance-linear. S. CÆ'SIA.
16 Lvs. broad-ovate, abruptly narrowed into a winged petiole. *N.* S. THYRSOÌDEA.
16 Lvs. broad-lanceolate, tapering into a winged petiole. *S.*....S. GLOMERÀTA.
16 Lvs. narrow, blunt-serrate. Hds. 1—12, very large. Scales acute. S. VIRGAÙREA.
16 Lvs. narrow, blunt-serrate. Hds. many, panicled. Scales obtuse. S. HÙMILIS.
17 Branches and stalks downy. Lvs. oval. Hds. large, handsome. S. SPECIÒSA.
17 Smooth all over, straight, slender. Lvs. lanceo., blunt-serrate. *N.* S. STRÍCTA.
17 Smooth all over, very slender. Leaves small, entire. *S. M.*..S. VIRGÀTA.
18 Root lvs. spatulate, stem lvs. lanceolate. Scales awl-shaped...S. PUBÉRULA.
18 Root lvs. spat., stem lvs. short-obovate. Scales linear. *S.*..S. PULVERULÉNTA.
18 Rt. lvs. ovate, abruptly narrowed into a winged petiole. *May. Jn. S.* S. VERNA.
19 Smooth all over. Lvs. obtuse, flat. Heads all corymbed. *W.*..S. OHIÉNSIS.
19 Br'nchs, &c. dust-downy. Lvs. acute, concave. Hds. corym. *W.* S. RIDDÉLLII.
19 Br'nchs & stalks hairy-downy. Corymb form'd of racemes. *S.* S. CORYMBÒSA.
20 Stem stout, 3—4f high. Lvs. stiff and rough. Hds. very large...S. RÍGIDA.
20 Stem in tufts, not 1f high. Lvs. sharp-serrate. *Mounts. S.*..S. SPITHAMÆ'A.
21 Lvs. lanceo., obscurely 3-veined, thick. Hds. large. *E.*..S. SEMPERVÌRENS.
21 Leaves lance-linear, 1-veined, thick. Heads small. *S.*...S. ANGUSTIFÒLIA.
21 Leaves lance-linear, veinless, dotted. Plant sweet-scented.....S. ODÒRA.
22 Leaves smooth and glabrous, serrate. Racemes short. *W.*.......S. SHORTII.
22 Lvs. downy beneath, rough above, serrate. Rac. rather long. S. CANADENSIS.
23 Stem 3—6f high. Lvs. roughish above, veins beneath hairy. S. SEROTÌNA.
23 Stem 3—8f high. Lvs. quite smooth both sides. Hds. largish. S. GIGÁNTEA.
23 Stem 1—2f high, slender. Lvs. smooth, lance-linear. *W.* S. MISSOURIÉNSIS.
24 St. very leafy. Panicle dense, tapering upward. Rays showy. S. ELLÍPTICA.
24 St. very leafy. Pan. dense, tapering upward. Rays short. *S.*...S. ELLIÒTII.
24 Stem few-leaved. Root lvs. large. Panicle somewhat level-topped....25
25 Racemes long, recurved, panicle broad. Petioles all winged...S. ARGÙTA.
25 Rac. short, suberect, panicle narrow. Rt. petioles not wing'd. S. NEGLÉCTA.
26 Leaves large, thick, very rough on the upper side.............S. PATULA.
26 Leaves large, thin, smooth both sides.................S. MUHLENBÉRGIA.
27 Disk florets 8—12. Lower lvs. long-stalked. Panicle loose...S. BOÓTTII.
27 Disk flts. 3—5. Lvs. elliptic-ovate. Rac. few, long, spreading. S. ULMIFÒLIA.
27 Disk flts. 3—5. Lvs. lanceolate. Racemes short. Plant small..S. LINOÌDES.
27 Disk flts. 3—5. Lvs. linear, subserrate. Plant 2—3f high. *S.* S. TORTIFÒLIA.

28 Leaves coarsely serrate, very veiny. Stem stout, 2—7f high..S. ALTISSIMA.
28 Leaves finely serrate, nearly veinless. Stem stout, 3—7f high...S. PILÒSA.
28 Lvs. blunt-serrate or entire, grayish. Stem 1—2f high......S. NEMORÀLIS.
29 Rays 15—20, minute. Lvs. lance-linear, 3—5-veined.....S. LANCEOLÀTA.
29 Rays 10—12, minute. Lvs. narrow-linear, 1-veined......S. TENUIFÒLIA.
29 Rays 1—3. Lvs. lanceol. Hds. panicled. Shrub. *S*...S. PAUCIFLOSCULÒSA.

2. HELIANTHUS. SUNFLOWER.

Heads many-flowered, rays neutral, disk florets perfect. Scales of the involucre in several rows, more or less imbricated. Receptacle flat or convex, the chaff persistent, embracing the 4-sided, flattened achenia. Pappus of 2 chaffy awns, deciduous.—Herbs mostly ♃, rough. Leaves opposite, the upper often alternate, mostly 3-veined. Heads mostly large (the disk ½′—12′ broad), rays yellow, disk yellow or purple. *July—Oct.*

1 Corollas of the disk dark purple....2
1 Corollas of the disk yellow....3
2 Involucre scales short, regularly imbricated, not leafy....8
2 Involucre scales irregularly and loosely spreading....7
3 Leaves nearly all opposite and 3-veined....4
3 Leaves nearly all alternate and feather-veined....10
4 Scales of the involucre short, close, regularly imbricated....9
4 Scales of the involucre loose, irregular, the outer often leafy....5
5 Heads small (disk ½′ broad), with 5—10 rays....11
5 Heads large (disk about 1′ broad), rays 8—15....6
6 Scales of the invol. lance-linear, tapering, longer than disk. Lvs. thin....12
6 Scales of the invol. ovate-lanceolate, about as long as disk. Lvs. thick....13
7 Plant annual, cultivated. Heads very large.† *common*........H. ANNUUS.
7 Perennial, wild. Lvs. lance-linear. Hds. small. *M.S.*.H. ANGUSTIFÒLIUS.
8 Rays 7—10, very short, sometimes none. Leaves broad. *S*....H. RÀDULA.
8 Rays 12—16, long. Head only one. Lvs. of two forms. *S.* H. HETEROPHÝLLA.
8 Rays 12—16, long. Hds. several. Lvs. obtuse at each end. *S.* H. ATRORÙBENS.
8 Rays 20—24, long. Lvs. very stiff and rough, acute or pointed. *W.* H. RIGIDUS.
9 Plant rough, green. Lvs. serrate, on short petioles. *W*...H. LÆTIFLÒRUS.
9 Plant rough, green, nearly leafless above. Pet. long. *W.* H. OCCIDENTÀLIS.
9 Plant grayish-downy. Lvs. sessile with a narrow base. *W*...H. CINÈREUS.
9 Plant whitish-woolly. Lvs. sessile with a broad base. *W*.......H. MOLLIS.
10 Leaves long-lanceolate, serrate. Stem rough and hairy.....H. GIGÀNTEUS.
10 Lvs. long-lanceo., coarse-serrate. St. smooth, glauc. *W.* H. GROSSE-SERRÀTUS.
10 Leaves lance-ovate, nearly entire. Stem downy. *W. S.*..H. TOMENTÒSUS.
10 Leaves ovate, the lower cordate. Gardens. *Artichoke*......H. TUBERÒSUS.
11 Whole plant smooth, slender, nearly simple. Rays 10. *S.* H. LONGIFÒLIUS.
11 St. smoothish, generally much branched. Rays 6. *W.* H. MICROCÈPHALUS.

12 Tall,slend.,brhs.nearly leafless. Lvs. serr.Rays 12–15. *W.* H.TRACHELIIFÒLIUS.
12 Tall, leafy. Lvs. ovate-pointed, coarse-serrate. Rays 9–12. H. DECAPÉTALUS.
13 Lvs. petiolate, with a pointed base, slightly serrate.......H. STRUMÒSUS.
13 Lvs. petiolate, ovate, often cordate, large, serrate. *W.*..H. DORONICOÌDES.
13 Lvs. petiolate with a rounded base. Stem bristly-hairy. *W.*..H. HIRSÙTUS.
13 Lvs. sessile with a broad base, divaricate...............H. DIVARICÀTUS.

3. BI'DENS. BURR-MARIGOLD.

Involucre scales nearly equal, double, the outer generally large and leafy. Rays few (3—8, or sometimes none), neutral, disk perfect. Receptacle chaffy, flat. Achenia flattened or 4-sided, crowned with 2—4 awns which are hispid backwards.—Leaves opposite. *July—Oct.*

1 Rays inconspicuous or none....2
1 Rays quite showy, yellow....4
2 Achenia flattened, broadest at top....3
2 Achenia slender, 4-sided....5
3 Lvs. pinnately 3—5-foliate, divisions distinct. Rays 0......B. FRONDÒSA.
3 Lvs. simple, lower ones sometimes 3-parted. Rays 0.......B. CONNÀTA.
3 Lvs. simple, scarcely connate. Rays sometimes present......B. CÉRNUA
4 Lvs. narrow-lanceolate, equally serrate, connate....B. CHRYSANTHEMOÌDES.
4 Lvs. mostly under water and very finely divided. *M.*............B. BECKII.
5 Heads small, with small, white rays. Lvs. pinnate. *S.*...B. LEUCÁNTHA.
5 Heads with very short yellow rays. Leaves bipinnate......B. BIPINNÀTA.

4. COREOP'SIS. TICK-SEED.

Involucre many-flowered, double, each of 8—13 scales, the outer leafy, the inner membranous. Receptacle flat, the chaff falling with the fruit. Achenia flattened, often winged, emarginate, each commonly with 2 teeth or awns which are not hispid downwardly as in BIDENS.—Leaves generally opposite. Heads showy (rarely rayless).

1 Heads discoid (without rays)....4
1 Heads radiate, rays showy....2
2 Disk yellow, rays also yellow, mostly entire....3
2 Disk yellow, rays rose-colored, 3—5-toothed at the end....11
2 Disk purple, rays yellow with a purple base, toothed....10
2 Disk purple, rays wholly yellow, toothed at the end....9
3 Leaves petiolate, compound with lanceolate, toothed divisions....5
3 Leaves petiolate, compound, with linear, entire divisions....6
3 Leaves petiolate, simple, or some of them eared at base....7

4 Leaves on long petioles, ternately divided. *W*................C. DISCOÌDEA.
4 Leaves on short petioles, toothed, lance-linear. *S. r*........C. BIDENTOÌDES.
5 Leaflets 3—5. Outer scales about 8. Achenia 2—4-toothed. *S*..C. AÙREA.
5 Lfts. 5—7. Outer scales about 8. Ach. slender, 2-toothed. C. TRICHOSPÉRMA.
5 Lfts. 5—7. Outer scales 10—13. Achenia 2 or 4-awned. *W*..C. ARISTÒSA.
6 St. 4—8f high. Hds. on short stalks. Rays ½' long, entire. *W.S.* C. TRÍPTERIS.
6 St. 1—2f high. Hds. on long stalks. Rays 1' long, 4—5-cleft. *S.* C. GRANDIFLÒRA.
7 Stem 4—6f high. Rays entire. Leaves ovate, serrate. *S*.....C. LATIFÒLIA.
7 St. 1—3f high. Rays 2—5-toothed. Lvs. often eared at base. *S.* C. AURICULÀTA.
7 St. 2—3f high. Rays 4—5-toothed. Lvs. lanceolate, entire. *S.* C. LANCEOLÀTA.
8 Leaf divisions all entire, appearing in 6-leaved whorls. *S*.....C. SENIFÒLIA.
8 Leaf divisions all again divided into narrow-linear lobes. *W.* C. VERTICILLÀTA.
8 Lvs. deeply 3-cleft, wedge-shaped, lobes linear, not whorled. *W*..C. PALMÀTA.
9 Leaves sessile, 3-parted, the divisions often lobed. *S*....C. DELPHINIFÒLIA.
9 Lvs. petioled, lanceolate, sometimes divided. Stem round. *S*..C. GLADIÀTA.
9 Lvs. petioled, narrow-spatulate, entire. Stem square. *S*..C. ANGUSTIFÒLIA.
9 Lvs. petioled, lance-ovate, entire. Stem round below. *S*..C. INTEGRIFÒLIA.
10 Lvs pinnately 3—5-foliate, divisions oblong-oval, entire.†..C. DRUMMÓNDII.
10 Lvs. pinnately much divided, divisions linear, entire.†.......C. TINCTÒRIA.
11 Stem leafy, lvs. narrow-linear, entire. Rays rose-white. *E*.....C. RÒSEA.
11 Stem few-leaved, lvs. awl-shaped, entire. Rays rose-red. *S*...C. NUDÀTA.

5. ASTER. Starwort.

Heads many-flowered. Scales of the involucre generally imbricated in two or more rows, and with green tips. Disk florets tubular, perfect, rays fertile, in one row, oblong, revolute when old. Receptacle flat, marked with pits. Pappus simple, hair-like, rough. Achenium usually flattened.—A large genus of ♃ herbs, very abundant in the United States, flowering in late summer and autumn. Leaves alternate. Disk florets yellow, changing to purple, rays blue, purple or white, never yellow.—The species are very variable, and many of them are hard to distinguish.

1 Radical and lower leaves cordate and petiolate....2
1 Radical leaves never cordate....4
2 Heads in loose corymbs. Rays white or whitish....8
2 Heads in racemes or panicles, blue or bluish....3
3 Leaves evidently serrate; rays light blue, about 12, spreading ½'....9
3 Leaves entire or nearly so; rays bright blue, spreading near 1'....10
4 Involucre scales tipped with green, or the outer ones wholly green....5
4 Involucre scales with scarious margins or wholly scarious....7
5 Stem leaves clasping with a cordate or auricled base....6
5 Stem leaves sessile, rarely clasping, never cordate nor auricled....15

6 Invol. scales close, in several rows, outer ones gradually shorter....11
6 Invol. scales loose, nearly equal, outer ones often wholly green....12
7 Leaves lanceolate and linear-lanceolate, more or less rough....13
7 Leaves linear, fleshy, very smooth, entire. Salt marsh herbs....14
8 Slender, with thin, serrate leaves. Heads about 6-rayed....A. CORYMBÓSUS.
8 Stout, with large, thick serrate, rough lvs. Hds. about 13-ray. A. MACROPHÝLLUS.
9 Involucre scales close, obtuse. Leaves sharply serrate....A CORDIFÒLIUS.
9 Invol. scales awl-shaped, long and loose. Lvs. blunt-serrate. A. SAGITTIFÒLIUS.
10 Stem lvs. sessile, rough, lanceolate and linear. Hds. middle size. A. AZÙREUS.
10 Stem lvs. sessile, rough, oblong, the lower obtuse. Hds. small. A. ASPÉRULUS.
10 St. leaves on winged stalks with rounded clasping bases, wavy. A. UNDULÀTUS.
10 Stem leaves on naked stalks, all cordate, pointed, entire.......A. SHÓRTII.
11 Plant rough-downy. Lvs. entire. Scales slender pointed.....A PÀTENS.
11 Plant smooth and glaucous. Scales broad, acute.............A. LÆVIS.
12 Lvs. sharply cut-serrate, with a long, slender, entire base. A. PRENANTHOÌDES.
12 Lvs. sparingly serrate, lanceolate. Stem hairy, often red....A. PUNÍCEUS.
12 Lvs. entire, rough, numerous. Rays nearly 100, ¼' long. A. NOVÆ-ANGLIÆ.
13 Lvs. coarsely toothed, long-pointed, often clustered. Rs. white. A. ACUMINÀTUS.
13 Lvs. nearly entire, acute, with edges revolute. Hds. 1—3. A. NEMORÀLIS.
13 Lvs. entire, stiff, acute. Hds. small, in a close corymb..A. PTARMICOÌDES.
14 Hds. large, with showy rays. St. flexuous. Sca. in many rows. A. FLEXUÒSUS.
14 Heads numerous, with very short rays in 2 rows...........A. LINIFÒLIUS.
14 Heads with showy blue rays. Scales in 2 or 3 rows......A. DIVARICÀTUS.
15 Many species, very variable, here omitted.

6. ERIGERON. FLEA-BANE. WHITE-WEED.

Heads many-flowered, mostly hemispherical, rays very numerous (20—200), narrow, linear, pistillate; disk flowers perfect. Receptacle flat, naked (no chaff or pits). Scales of the involucre nearly equal and in one row. Pappus generally simple.—Herbs with alternate leaves. Rays white, blue or reddish. Flowering from May to September.

1 Rays showy, longer than the involucre. Heads large (½—1' broad)....2
1 Rays obscure, shorter than the involucre, whitish. Heads very small....3
2 Rays purple, very numerous. Heads loosely corymbed....4
2 Rays white or whitish. Heads loosely panicled....5
3 Stem erect, hairy. Leaves lanceolate. Heads panicled...E. CANADÉNSE.
3 Stems prostrate, diffuse. Lvs. linear. Hds. corymbed. *W*..E. DIVARICÀTUM.
4 Leaves nearly entire. Rays 50—80, bluish-purple.......E. BELLIDIFÒLIUM.
4 Leaves nearly entire. Rays 150—200, reddish-purple..E. PHILADÉLPHICUM.
4 Lvs. sinuate-pinnatifid-toothed. Rays 100-200, light purp. *S.* E. QUERCIFÒLIUM.

5 Stem leafy, 3—5f high. Leaves coarsely-toothed.....E. HETEROPHÝLLUM.
5 Stem leafy, 2—3f high. Lvs. nearly entire and smooth.....E. STRIGÒSUM.
5 Stem leafless, 1—2f high. Heads few; rays about 30. *S*.....E. VÉRNUM.

7. ACHILLE'A. YARROW. MILLFOIL.

Heads many-flowered, rays few, fertile; receptacle flat, chaffy; achenia flattened, margined, without a pappus.—♃ European herbs with small, 4—12-rayed heads in corymbs. *June—Sept.*

Leaves twice pinnatifid with fine segments. Rays 4 or 5. *c*....A. MILLEFÒLIUM.
Leaves undivided, lance-linear, serrate. Rays 8—12. *r*..........A. PTÁRMICA.

8. TARAX'ACUM. DANDELION.

Involucre many-flowered, double, the outer of small scales, much shorter than the close, erect row of the inner. Receptacle naked. Achenia produced into a long beak crowned with copious, white, hair-like bristles of the pappus.—Acaulescent herbs with runcinate leaves.

T. DENS-LEÒNIS. Outer scales of the involucre reflexed. Leaves runcinate, smooth, dentate.—In all open situations, blossoming at all seasons except winter. Scape round, hollow, lengthening after flowering, and bearing a globular head of seeds and seed-down, whose light and airy form is a very familiar sight to all.

9. HIERA'CIUM. HAWK-WEED.

Involucre more or less imbricated, egg-shaped, many-flowered. Achenia not prolonged into a beak, striate. Pappus of rough, brittle, numerous tawny bristles in a single row.—♃ Leaves alternate, entire or toothed. Florets yellow. *July—Sept.*

1 Involucre and stalks smooth or nearly so....2
1 Involucre, stalks, &c. rough with glandular hairs....3
2 St. leafy, corym. at top.Lvs. sharp-toothed. Hds.50–60-fl'wd. *N.* H.CANADÉNSE.
2 St. leafy, widely panicled. Lvs.fine-toothed. Hds.10–20-fl'wd. H.PANICULÀTUM.
2 St. almost leafless, corymbed. Lvs. entire. Hds. 15–20-flowered. H. VENÓSUM.
3 Hds. 40—50-flowered, corymbed. Plant stiff, rough-hairy...H. SCABRUM.
3 Hds.20—30-fl w'd.Pl.clothed with straight bristles 1′long. *W.* H.LONGÍPILUM.
3 Hds. 20—30-flowered. Plant slender, quite hairy below....H. GRONÒVII.

NAB'ALUS. Lion's-foot.

al, double, the inner of many linear scales in a few short scales at base. Receptacle naked. -te, not beaked, crowned with a copious, straw- hair-like pappus.—Erect herbs, with a thick Heads 5—18-flowered, white or straw-colored — *Oct.*

lulous. Leaves multiform in the same plant....2
r nodding. Leaves reniform, undivided....6
ads (8—12-flowered) in a corymb-like panicle....3
ads in a long, raceme-like panicle....4
eads racemed. Found only on high mountains....5
lor. Lvs. chiefly hastate, often lobed.......N. ÁLBA
Leaves chiefly deltoid, often cleft......N. FRASÉRI
ided or cleft or entire. Pap. dull-white. N. ALTÍSSIMUS
owest lvs. pinnatifid. Pap. straw-color. N. VIRGÀTUS
hort-ovate, close scales. Lvs. deltoid, &c...N. NÀNUS
r, loose scales. Lvs. cordate-hastate, &c..N. BOÓTTII
-flowered. Panicle spike-form. *W. M.*.N. RACEMOSUS
-flowered. Panicle corymbed. *W. S.*.N. CREPIDÍNEUS
owered. Panicle racemed. *W.*............N. ÁSPER

6. LOBELIA'CEÆ.—Lobeliads.

leaves, scattered flowers and often milky juice la irregular, 5-lobed, tube split down to the base o a tube both by the filaments and anthers. le calyx tube, *styles* united into one. uit a 2—3-celled, many-seeded capsule.

A. CARDINAL-FLOWER. INDIAN TOBACCO.

es of the irregular corolla are smaller than the as united into a curved tube. Stigma 2-lobed op. Seeds very small.—Flowers axillary, gen- or bracted racemes. *July—Sept.*

es nearly all crowded at the root, under water....9
scarlet, large and showy....5
to bluish-white....3

3 Stem stout, 2—3 or 4f high. Flowers large, about 1′ long....6
3 Stem slender, 6′—2f high. Flowers small (¼′—½′ long)....4
4 Stem branched, racemes several, loose, or flowers scattered....7
4 Stem generally simple, bearing a single raceme....8
5 Stem smooth. Lvs. oblong-lanceolate, acute at each end...L. CARDINÀLIS.
5 Stem downy. Leaves linear-lanceolate, long-pointed.† *S.*....L. FÚLGENS.
6 Leaves obtuse, denticulate. Raceme one-sided. Plant downy..L. PUBÉRULA.
6 Leaves acute, slightly toothed. Raceme equal. Plant hairy. L. SYPHILÍTICA.
6 Lvs. acuminate, toothed. Rac. one-sided. Plant smoothish. *S.*..L. AMŒ'NA.
7 Hairy. Leaves ovate-lanceolate, toothed. Pod inflated......L. INFLÀTA.
7 Smooth. Lvs. roundish-ovate, crenate-dentate, petiolate...L. MICHAÚXII.
7 Smooth. Lvs. linear-spatulate, entire. Flowers blue-white....L. KÁLMII.
8 Pedi. twice as long as fls. Lvs. linear. Pl. extremely slend. *S.M.* L. NUTTÀLLII.
8 Pedicels as long as the fls. Racemes dense. Leaves oblong.....L. SPICÀTA.
8 Pedi. none. Spike rather dense. Lvs. lance-oval, smooth. *W.* L. LEPTOSTÀCHYA.
8 Pedi. very short. Fls. few. Lvs. linear-lanceolate, thickish. *S.* L. GLANDULÓSA.
9 Rt. lvs. linear, terete, hollow, fleshy, 2′—3′ long. Scape long. L. DORTMÁNNA.
9 Root lvs. linear-oblong, flat, 4′—6′ long. Stem tall. *S.*......L. PALUDÓSA.

ORDER 77. CAMPANULA'CEÆ.—BELLWORTS.

Herbs **with a milky juice, alternate *leaves*, *flowers* mostly blue and showy, with a superior *calyx*, a regular and mostly campanulate, 5-lobed *corolla* with the 5 *stamens* usually separate, and *ovary* adherent to the calyx tube, and with the 2—5-celled *pod* crowned with the remains of the calyx.**

ANALYSIS OF THE GENERA.

Calyx tube very short (below the flower)..........................CAMPÁNULA. 1
Calyx tube long and three-angled..........................SPECULÀRIA.

1. CAMPAN'ULA. BELL-FLOWER. HAREBELL.

Calyx 5-cleft. Corolla bell-shaped, funnel-shaped or wheel-shaped, its 5 lobes valvate in the bud, closed at the base inside by the valve-like bases of the 5 stamens. Pod opening on the sides.—♃ Herbs with axillary or terminal flowers. *June—Oct.*

1 Corolla wheel-shaped, flat, in leafy spikes....4
1 Corolla bell-shaped, &c., broadly or narrowly....2
2 Flowers on slender pedicels, solitary or panicled....3
2 Flowers sessile or nearly so. Stem erect. Gardens....7
3 Flowers large (6″—12″ broad). Root lvs. unlike the stem lvs....5
3 Flowers small (2″—5″ broad). Leaves all similar in form....6

4 Stem tall (3—5f), branches spreading. Upper lvs. hairy. *W.*. C. ILLINOIÉNSIS.
4 Stem tall (2—4f), simple. Lvs. pointed at ends, smooth. *M. W.* C. AMERICÀNA.
4 St. low (7′—12′), simp. Lvs. thick, shining, obtuse or acute.† C. PLANIFLÒRA.
5 St. weak, inclining. Rt. lvs. roundish, stem lvs. linear. *N.* C. ROTUNDIFÒLIA.
5 St. erect. Lvs. obovate and lance-linear. Fls. very broad.† C. PERSICIFÒLIA.
6 Stem reclining, rough backwards. Lvs. narrow. Fls. white. C. APARINOÌDES.
6 Stem erect. Panicle wide. Lvs. lanceo., toothed. Fls. blue. *S.* C. DIVARICÀTA.
7 Flowers crowded above, funnel-shaped. Plant smooth.†... C. GLOMERÀTA.
7 Flowers distant, very large, obtuse at base. Plant bristly.†... C. MÈDIUM.
7 Fls. scattered, rather large, acute at base. Plant woolly.†.. C. LANUGINÒSA.

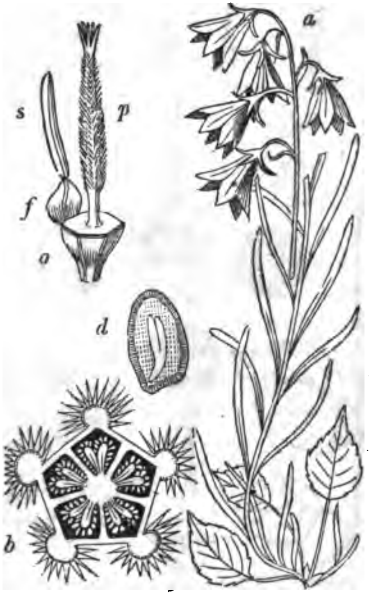


Fig. 235. *a*, Campanula rotundifolia, whole plant. *o*, Ovary of Campanula Medium (Canterbury Bells), with *f*, a broad filament, *s*, an anther, and *p*, the hairy style. *b*, A cross section of the curious 5-celled seed vessel, 2 placentæ in each cell; *d*, seed cut open, showing the large embryo.

ORDER 78. ERICA'CEÆ.—HEATHWORTS.

Herbs or more generally *shrubs* with simple, often evergreen leaves, *flowers* regular or nearly so, 4 or 5-parted, *petals* rarely almost distinct, *stamens* as many or twice as many as the lobes of the corolla, and the *anthers* oddly appendaged and generally opening by two terminal pores, the *style* 1 and the *ovary* 4—10-celled, with albuminous seeds.

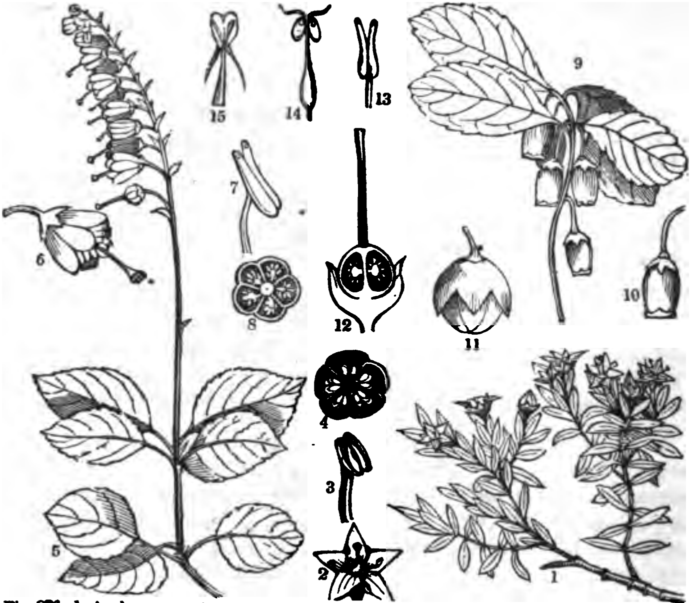


Fig. 236. 1, Azalea procumbens. 2, A flower enlarged. 3, A stamen, much enlarged, showing the lengthwise opening of each of the cells. 4, Cross section of a 5-celled capsule of Rhododendron, showing the inflexed margins of the valves. 5, Pyrola secunda. 6, A flower enlarged. 7, A stamen enlarged, showing the terminal tubes and pores. 8, Cross-section of a 5-celled, many-seeded capsule. 9, Gaultheria (Checkerberry). 10, A flower enlarged. 11, A berry. 2, Vertical section of the ovary, showing the free, fleshy calyx. 13, Anther of Vaccinium Vitis dæ. 14. Stamen of Arctostaphylos (Bear-berry). 15. Awned stamen of a Vaccinium (Blueberry).

ANALYSIS OF THE GENERA.

1 Shrubs with green leaves, erect or prostrate....2
1 Herbs, with green and mostly radical leaves....18
1 Herbs, destitute of green leaves or of any green color....19
2 Ovary free from the calyx (superior)....3
2 Ovary adherent to the calyx tube (inferior)....9
3 Petals united into a monopetalous corolla....4
3 Petals entirely or very nearly separate and distinct....8
4 Flowers 4-parted, with 8 stamens....10
4 Flowers 5-parted, with 5—10 stamens....5
5 Corolla small, urn-shaped, &c., the limb small and narrow....6
5 Corolla small or large, the limb widely spreading....7
6 Fruit fleshy, a drupe or berry....11
6 Fruit a dry pod (capsule)....12
7 Corolla limb entire, saucer-form....14
7 Corolla limb 5-cleft or lobed, funnel or bell-form....13
8 Pods 3-celled, cells many-seeded....15
8 Pods 5 or 7-celled, cells many-seeded....16
8 Pods 2 or 3-celled, cells only one-seeded....17

(Sub-order 1. VACCI'NEÆ. Blueberries, &c.)

9 Erect shrubs. Cor. urn-shaped, &c. Limb narrow. *Blueberry,&c.* Vaccínium.
9 Trailing or erect. Cor. deeply 4-cleft, lobes reflexed. *Cranberry.* Oxycóccus. 1
9 Trailing shrubs. Cor. deeply 4-cleft, lobes spreading. *Boxberry.* Chiógenes.

(Sub-order 2. ERICI'NEÆ. True Heathworts.)

10 Leaves linear-acerose, whorled or crowded. *Cult. Heath*........Erica.
10 Leaves oval-lanceolate. A shrub 4f high. *S* ....Menzièsia *globulàris*.
11 A very small shrub (almost herbac.). Berry many-seeded...Gaulthèria.
11 Shrubs trailing or tufted. Drupe 5-seeded. *Bearberry*...Arctostaphýlus.
12 Pod opening between cells. Lvs. linear, heath-like. Menzièsia *taxifòlia*.
12 Pod open. into cells. Lvs. broad (in *A. hypnoides* moss-like). Andromèda.
13 Stam. included. Plant trailing, with large oval lvs. *May-flower*..Epigæ'a.
13 Stamens included. Plant and lvs. very small. Fls. rose-red.....Azàlea.
13 Stam. long, projecting from large, slightly irreg. corolla. Rhododéndron. 2
14 Anthers held in 10 pits of the corolla. *Calico-bush, &c.*.......Kálmia. 3

15 Leaves alternate, deciduous, serrate. Fls. racemed....CLÈTHRA *alnifòlia.*
15 Lvs. mostly oppos., evergr., ent. Fls. umbeled. *Sand Myrtle.* LEIOPHÝLLUM.
16 Flowers 5-parted. Corolla regular. *Labrador Tea*...........LÈDUM.
16 Flowers 5-parted. Corolla irregular............RHODÒRA *Canadénsis.*
16 Flowers 7-parted, regular. Stamens 14. *S.*..........BEFÀRIA *racemòsa.*

(SUB-ORDER 3. CYRIL'LEÆ. CYRILLADS.)

17 Fls. 4-parted, with 8 stamens and a 2-seeded pod. *S.*..ELLIÓTTIA *racemòsa.*
17 Fls. 4-parted, with 5 stamens. Lvs. lanceo. entire. *S.* CYRÍLLA *racemiflòra.*
17 Fls. 5-p'ted, with 10 sta. Lvs. lanceo., entire. *S.* MYLOCÀRYUM *ligustrinum.*

(SUB-ORDER 4. PYRO'LEÆ. PÝROLAS.)

18 Flowers racemed, many. Perennial, low, smooth, erect......PÝROLA. 4
18 Flower solitary, one only. Perenn. small. *N. r.*....MONÈSES *uniflòra.*
18 Fls. corymbed, few. Lvs. evergreen, thick....*Pipsissewa*..CHIMÁPHILA.

(SUB-ORDER 5. MONOTRO'PEÆ. INDIAN PIPES.)

19 Flower solitary, petals separate. Plant white..*Indian Pipe.* MONÓTROPA.
19 Fls. crowded in hds., reddish-white. *S.*..*Carolina Beechdrops.* MONOTRÓPSIS.
19 Flowers in a short raceme. Plant tawny.......*Pine-sap*....HYPÓPITYS.
19 Fls. in a long raceme. Petals united. Plant brown, 1f. *N.*..PTERÓSPORA.

1. OXYCOC'CUS. CRANBERRY.

Calyx superior, 4-cleft. Corolla 4-parted, with lance-linear, reflexed segments. Stamens 8, anthers tubular, 2-parted, opening by oblique pores. Berry globular, 4-celled, many-seeded.—Trailing and very slender, with woody stems, alternate, thick, narrow, entire leaves, and acid, eatable fruit. Flowers purplish. *June.*

Trailing. Lvs. ovate, 2''—4'' long. Pedicels terminal, 1-flowered. O. PALÚSTRIS.
Trailing. Lvs. oblong, 4''—6'' long. Pedics. axillary, 1-flw'd. O. MACROCÁRPUS.
Erect. Lvs. oval, pointed, serru. Pets. not reflexed at first. *S.* O. ERYTHOCÁRPUS.

2. RHODODEN'DRON. ROSE-BAY. SWAMP PINK.

Calyx 5-parted, small. Corolla funnel or bell-form, generally a little irregular, 5-lobed. Stamens 5—10, mostly projecting and declined, anthers opening by two terminal pores. Pods 5-celled,

5-valved.—Shrubs with alternate, entire leaves. Flowers mostly in corymbed, terminal clusters, variously shaded with blue, red or white.

1 Leaves evergreen, leathery. Cor. mostly bell-form. Stamens 10....3
1 Lvs. deciduous. Cor. funnel-form. Stam. 5, sometimes 6 or more....2
2 Flowers leafy, appearing after the leaves have grown....4
2 Flowers expanding before the lvs. or at the same time with them....5
3 Leaves large, acute or acuminate, smooth....6
3 Leaves small, oval, obtuse at each end....7
4 Smooth. Seps. long, conspic. Cor. large, rose-colored, 3-10f. R. ARBORÉSCENS.
4 Bristly-hairy. Sep. minute. Cor. clammy-hairy, whitish, 4-10f. R. VISCÒSUM.
5 Sepals minute. Cor. tube longer than the lobes, flesh-purple. R. NUDIFLÒRUM.
5 Sep. 3″—4″ long. Cor. tube shorter than lobes, orange-red. R. CALENDULÀCEUM.
5 Sep. short, one of them 4 times longest. Cor. small, red-white. *S.* R. BÍCOLOR.
6 Lvs. discolored beneath, 4′—9′ long. Corymbs very large, spotted. R. MÁXIMUM.
6 Lvs. resin-dotted beneath. Fls. small, funnel-form. Pods long. R. PUNCTÀTUM.
6 Lvs. green both sides, pointed. Fls. large, few, wheel-bell-form. † R. PÓNTICUM.
7 Shrub 3—4f high. Fls. rose-colored, bell-form, corymbed. R. CATAWBIÉNSE.
7 Shrub 4′—8′ high, in tufts. Fls. solitary, blue-purple. *Mts.*. R. LAPÓNICUM.

3. KAL'MIA. Calico-bush. Mountain Laurel.

Calyx 5-parted. Corolla with 10 prominences beneath and 10 corresponding pits within, holding the 10 anthers. Filaments recurved. Border with 5 shallow lobes. Capsule 5-celled, many-seeded.—Beautiful shrubs, with entire, evergreen, leathery leaves. Flowers white and red, in racemed corymbs. *May—June.*

1 Flowers in terminal corymbs. Leaves smooth, thick....2
1 Flowers in lateral corymbs. Lvs. rusty or downy beneath....3
1 Flowers axillary, solitary, stalked, red. Plant hairy, 1—2f. *S.* K. HIRSÙTA.
2 Lvs. scat'd, green both sides. Corym. large, rose-white. 3—20f. K. LATIFÒLIA.
2 Lvs. opposite, glaucous-white beneath. Corymbs sml. lilac. 2—3f. K. GLAÙCA.
3 Lvs. scattered, wedge-oblong. Corymbs small, roseate. 3—5f. *S.* K. CUNEÀTA.
3 Lvs. opposite and in 3s. Corymbs small, deep purp. 3—4f. K. ANGUSTIFÒLIA.

4. PYR'OLA. False Winter-green.

Calyx 5-parted. Petals 5, equal. Stamens 10, anthers large, turned outwards, opening by 2 pores at the obtuse top. Style thick, long, stigmas 5, often projecting like rays. Pod 5-celled, 5-valved, opening into the cells, many-seeded.—♃ Low, evergreen herbs.

almost woody, with the leaves generally radical, and the scape bearing a raceme of nodding flowers. Mostly northern. *June*, *July*.

1 Stamens ascending, style declined and curved....2
1 Stamens and style straight and erect....5
2 Leaves thick and shining. Flowers white or rose-colored....3
2 Leaves green, not shining. Flowers greenish-white....4
3 Lvs. orbicular. Sepals ¼ as long as mostly white petals. P. ROTUNDIFÒLIA.
3 Lvs. round-cordate. Sep. ⅓ as long as the rose-colored pets..P. ASARIFÒLIA.
3 Lvs. roundish. Sepals ¼ as long as the red-purple petals....P. ULIGINÒSA.
4 Lvs. large, thin, elliptical, light green, on short petioles.......P. ELLÍPTICA.
4 Lvs. small, thick, roundish, twice shorter than the petioles..P. CHLORÁNTHA.
4 Lvs. none, or scarcely any. (A variety of *P. chlorantha?*) *N-E*. P. APHÝLLA.
5 Raceme with the greenish-white flowers all on one side......P. SECÚNDA.
5 Raceme spike-form, with small, globular, white flowers. *Mts*....P. MINOR.

ORDER 82. PRIMULA'CEÆ.

PRIMWORTS.

Herbs low, with the *leaves* either radical or mostly opposite, with the *flowers* 5- (rarely 4 or 6) parted, the *corolla* monopetalous, regular, the *stamens* inserted on the corolla tube and opposite to its lobes, the *ovary* 1-celled with a free, central placenta, *style* 1, *stigma* 1, the *capsule* 1-celled, many-seeded, *seeds* with fleshy albumen.

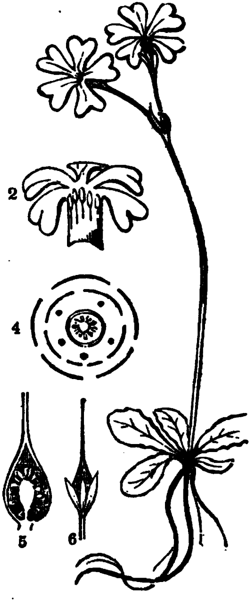


Fig. 237. Primula Mistassinica, the whole plant. 2, The corolla cut open, showing the stamens on the tube. 4, The plan of the flower, showing the stamens opposite the petals. 6, The calyx and ovary. 5, The fruit cut open, showing the seeds on the free central placenta.

ANALYSIS OF THE GENERA.

1 Stemless. Leaves all radical, scape bearing an umbel....3
1 Stems leafy. Flowers yellow, corolla wheel-form (tube none)....4
1 Stems leafy. Flowers white, red, &c., never yellow....2
2 Leaves whorled, at least those near the flowers. Corolla white....5
2 Leaves opposite, entire. Flowers axillary, solitary....6
2 Leaves alternate, entire. Flowers white....7
3 Corolla tube egg-shaped, lobes short, spread. *Dwarf Primrose.* ANDROSÀCE.
3 Corolla tube cylindrical, lobes spreading. *Primrose*..........PRÍMULA. 1
3 Corolla tube cylindrical, lobes reflexed. *American Cowslip.* DODECÁTHEON. 2
4 Cor. 5-parted, without intermediate teeth. Fls. axill. or rac..LYSIMÁCHIA. 3
4 Cor. 6-parted, with 6 intermediate teeth. Rac. axill. NAUMBERGIA *thyrsiflòra.*
5 Fls. 7-part. Lvs. entire, in a single whorl. *Chick Wintergreen.* TRIENTÀLIS.
5 Fls. 5-part. Lvs. finely pinnat., in water. *Feather-foil.* HOTTÒNIA *inflàta.*
6 Plant prostrate, with scarlet corollas. *Pimpernel*......ANAGÁLLIS *arvénsis.*
6 Plant erect, with no corolla, but white calyxes. *Black Saltwort*....GLAUX.
7 Fls. 5-parted, panicled. Plant 8′—15′ high. *Water Pimpernel*...SÁMOLUS.
7 Fls. 4-parted, axillary. Plant 1′—2′ high. *Dwarf Pimpernel.* CENTÚNCULUS

1. PRIM'ULA. PRIMROSE. AURICULA.

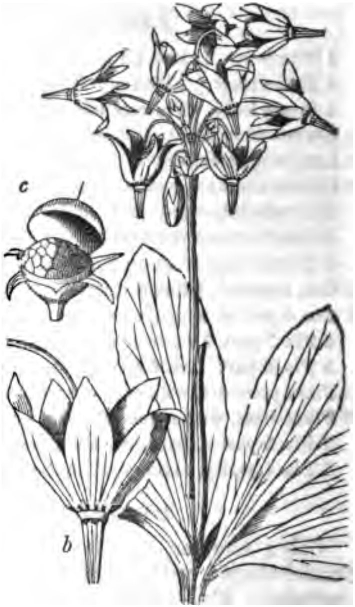
Calyx angular, 5-cleft. Corolla salver-shaped, or often rather funnel-shaped, with 5 entire or notched or bifid lobes. Stamens 5, included. Pod opening at the top, many-seeded.—♃ Herbs with the leaves all radical, and the flowers showy, in an umbel on a scape.

1 Corolla salver-form, limb abruptly spreading. Plants wild, rare....3
1 Corolla salver-form, limb abruptly spreading. Plants cultivated....4
1 Corolla funnel-form, limb gradually spreading. Cultivated....2
2 Leaves hairy, rugose, toothed or crenate or wavy at edge....5
2 Leaves smooth, plane, entire, or sometimes crenate....6
3 Plant smooth, green, 3′—8′ high. Fls. 1—8, flesh-col'd. *N.* P. MISTASSÍNICA.
3 Pl. covered with meal, 3′—10′ high. Fls. 3—20, lilac-yellow. *N.* P. FARINÒSA.
4 Petals obcordate, notched, yellow, varying to purple, &c.†..P. GRANDIFLÒRA.
4 Petals obtuse, entire, dark-violet, never yellow.†.............P. PURPÙREA.
5 Lvs. hairy both sides. Outer fls. nodding, border concave.† P. OFFICINÀLIS.
5 Lvs. smooth above. All the fls. nodding, border flat.†.........P. ELÀTIOR.
6 Leaves and calyx mealy-glaucous. Bracts very short.† ......P. AURÍCULA.
6 Lvs. white-edged. calyx inflated. Bracts long. Fls. purple.†...P. CALYCÌNA.

2. DODECA'THEON.

AMERICAN COWSLIP.

Calyx 5-parted, reflexed. Corolla tube very short, limb rotate, 5-parted, with the limb reflexed. Stamens 5, inserted into the throat of the corolla, filaments short, anthers long, acute connivent at apex, but shorter than the style.—♃ Leaves all radical, oblong, scape erect, bearing an umbel of nodding rose or white flowers. *May, June.*



. 238. Dodecatheon Meadia, whole plant. *b*, A single flower, natural size. c, Fruit (pyxis) of Anagallis, with its lid open, showing the seeds.

Filaments much shorter than the anthers. Scape 1—2f. *W.*†.....D. MEÁDIA.
Filaments about as long as the anthers. Scape 6′—10′. *W.*..D. INTEGRIFÒLIA.

3. LYSIMA'CHIA. LOOSE-STRIFE.

Calyx 5-parted. Corolla tube very short, limb 5-parted, spreading. Stamens 5, on the base of the corolla, filaments often united. Pods 5—10-valved. Seeds several or many.—♃ Leaves opposite or whorled, entire. Flowers mostly yellow. *June, July.*

1 Erect. Peduncles several-flowered, or flowers panicled....2
1 Erect. Pedicels one-flowered, flowers racemed....7
1 Erect. Pedicels one-flowered, flowers axillary....3
1 Prostrate, creeping. Pedicels (or umbels) axillary....8

2 Leaves thick, rather obtuse, with the edges rolled back....5
2 Leaves thin, acuminate, with the edges not rolled....6
3 Leaves mostly opposite, on petioles fringed with hairs....4
3 Leaves whorled in 3s, 4s and 5s, sessile. Stem simple...L. QUADRIFÒLIA.
4 Leaves ovate, often cordate. Stems mostly branched...........L. CILIÀTA.
4 Leaves lance-oblong, the upper whorled. Stems branched......L. HÍBRIDA.
4 Leaves linear-lanceolate, all opposite, the lower obtuse. *W.* L. HETEROPHÝLLA.
5 Leaves oblong-lanceolate. Panicle bracted, terminal. *S.*.L. ASPERIFÒLIA.
5 Lvs. lance-linear. Flowers large, scarcely panicled. *W.*..L. LONGIFÒLIA.
6 Lvs. whorled in 4s, lanceolate. Upper flowers racemed. *S.*.L. LANCEOLÀTA.
6 Lvs. opposite, ovate, often cordate. Panicle large. *S*..........L. FRASÈRI.
7 Leaves nearly opposite, narrow-lanceolate, with bulblets......L. STRÍCTA.
7 Lvs. whorled, in 4s or 5s, lanceolate, acuminate. *S*......L. HERBEMÓNTI.
8 Branches rooting at the end. Leaves lanceolate, acuminate....L. RÁDICANS.
8 Stem simple. Leaves roundish, very obtuse, opposite. *Vt.*.L. NUMMULÀRIA.

ORDER 91. SCROPHULARIA'CEÆ.—FIGWORTS.

Mostly *herbs* without fragrance, and irregular, unsymmetrical *flowers*.

Calyx mostly 5-parted, free from the ovary, persistent.

Corolla bilabiate, personate or otherwise irregular, lobes imbricated in the bud. *Stamens* 4, didynamous, often but 2; often with a 5th filament, rarely a 5th stamen. *Ovary* free, 2-celled, *style* 1, *stigma* 2-lobed, becoming in *fruit* a 2-celled, many-seeded capsule, with the placentæ in the middle. *Seeds* with abundant albumen.

ANALYSIS OF THE GENERA.

1 Herbs with the leaves alternate or all radical....2
1 Herbs with the leaves opposite, and sometimes whorled....8
1 Trees with large, cordate lvs. and panicles of scarlet fls.†...PAULÒWNIA.
2 Flowers (diandrous) with only 2 perfect stamens....3
2 Flowers (didynamous) with 4 stamens mostly of unequal length....4
2 Fls. (pentandrous) with 5 perfect stam. Cor. ròtate. *Mullein*..VERBÁSCUM. 1
3 Cor. 4-lobed, minute, white. Plant small. Lvs. radical. *S.* AMPHIÁNTHUS.
3 Cor. 4-lobed. Fls. spiked. Lvs. mostly radicle. Scape 1f. *N-W.* SYNTHÌRIS.

4 Corolla labiate, with the throat closed (personate)....5

4 Corolla labiate, throat open, upper lip arched....6

4 Corolla rather bell-shaped, with 5 nearly equal lobes....7

5 Cor. protracted into a spur behind. Racemes leafy. *Toad-flax*..LINÀRIA. 2

5 Cor. swollen into a sack behind. Rac. leafy.† *Snap-dragon*.ANTIRRHÌNUM.

6 Bracts lobed, generally col'd. Anth.-cells unequal.*Painted-cup*. CASTILLÈJA.

6 Bracts and leaves entire, green. Flowers purplish. *Chaff-seed*. SCHWÁLBEA.

6 Bracts and leaves serrate, green. Flowers yellow. *Lousewort*. PEDICULÀRIS.

7 Tall, erect, with large, nodding flowers. Gardens. *Foxglove*. DIGITÀLIS.

7 Low and minute. Cor. equally 5-cleft. In mud. *Mudwort*. LIMOSÈLLA.

8 Flowers with only 2 perfect stamens (diandrous)....9

8 Flowers with 4 perfect stamens, the 5th scarcely appearing....10

8 Flowers with 4 perfect stamens, and a 5th sterile distinct filament....14

9 Corolla labiate. Cal. 5-parted. Sterile filaments minute or 0..GRATIÒLA. 3

9 Cor. labiate. Cal. 5-parted. Sterile filam. forked.*Mud-flower*. ILYSÀNTHUS.

9 Cor. labiate. Calyx 4-parted. Fls. very small. *Semi-flower*. HEMIÁNTHUS.

9 Cor. rotate, with 4 nearly equal lobes, lower smallest.*Speedwell*.VERÓNICA. 4

10 Corolla labiate (2-lipped) the limb quite irregular....11

10 Corolla limb nearly regular, of 4 or 5 plane, spreading lobes....15

11 Stamens included in the tube of the corolla, generally in pairs....12

11 Stamens ascending beneath the erect, arched upper lip....13

11 Sta. descending into the sack-shaped lower lip. *Tall-pink*...COLLÍNSIA.

12 Lvs. serr. Sts. square. Palate of lower lip prominent. *Monkey-fl.* MÍMULUS. 5

12 Leaves many-cleft into fine divisions. *W*........... CONÒBEA *Multifida*.

12 Leaves entire. Corolla protracted into a spur behind. *Toad-flox*. LINÀRIA. 2

12 Lvs. entire. Cor. not spurred. Small, obscure weeds. *W.M.S.* HERPÉSTIS.

13 Fls. yellow, in a terminal, one-sided spike. *Yellow-rattle*..RHINÁNTHUS.

13 Fls. white, small, in a term. one-sided spike.*Mts. Eye-bright*. EUPHRÀSIA.

13 Fls. yellowish, axil., or in a leafy equal spike.*Cow-wheat*.MELAMPỲRUM.

14 Ster. filam. shorter than the rest, sm'th. Sds. winged.*Snake-head*. CHELÒNE. 6

14 Ster. filam. long, project., bearded. Sds. wingd. *Beard-tongue*. PENTSTÈMON.

15 Cor. white, rota., 4-part'd. Lvs. subulate-lin.*S*. POLYPRÈMUM *procumbens*.

15 Cor. purp., in a long, slndr. spike. Lvs. lance-ovat.*Blue-hearts*.BUCHNÈRA.

15 Cor. purp. or rose-white, axillary. Lvs. narrow-lin., entire. GERÁRDIA. 7

15 Corolla yellow, and 5-lobed as well as the calyx....16

16 Stamens scarcely longer than the tube of the corolla....17
16 Stamens long-projecting, with very large anthers. *S*.....MACRÀNTHERA.
17 Stam. quite unequal, anthers all perfect. Sepals very short. DASŸSTOMA. 8
17 Stam. unequ., upper pair with empty anths. Sep. leafy. *M. W.* OTOPHŸLLA.
17 Stam. about equal in length, anths. all perfect. Sep. long. *W.* SEYMÈRIA.

1. VERBAS'CUM. Mullein.

Calyx 5-parted. Corolla rotate, 5-lobed, slightly irregular. Stamens 5, all perfect, filaments woolly, at least the three upper ones. Pod roundish-egg-shaped, 2-valved, many-seeded.—Mostly ② herbs. Flowers in spikes, or panicles, or racemes. Lvs. alternate. *Jn.—Aug.*

Tall, woolly. Lvs. decurrent. Fls. spiked, 2 filaments smooth. *c.* V. THÁPSUS.
Branched, smooth. Lvs. serrate. Fls. racem. Fil. violet-woolly. *r.* V. BLATTÀRIA.
Whit.-downy, branched. Lvs. crenate. Fls. panic. Fil. white-woolly. *r.* V. LŸCHNITIS.

2. LINA'RIA. Toad-Flax.

Calyx 5-parted. Corolla personate with the throat closed by the prominent palate, upper lip reflexed, lower 3-cleft, tube inflated and spurred behind. Pod 2-celled, bursting below the top.—Herbs with the lower leaves generally opposite, the upper alternate. Flowers solitary, axillary, often forming leafy racemes. *June—Sept.*

1 Species found only in cultivation, in gardens....3
1 Species growing wild in fields and road-sides....2
2 Lvs. lance-linear. Fls. large, yellow, in a close raceme. Erect. L. VULGÀRIS.
2 Lvs. lin., obtuse. Fls. small, blue, loosely racem. St. erect. L. CANADÉNSE.
2 Lvs. ovate-hastate. Fls. small, yel'w. and purp. Stem prostrate. L. ELÁTINE.
3 Lvs. whorled, lanceo., acute. Fls. pale-violet-yel'w. L. TRIORNITHÓPHORUM.
3 Lvs. alternate above, lin'r. Fls. violet-blue, upper lip 2-divid. L. BIPARTÌTA.

3. GRATI'OLA. Hedge-hyssop.

Calyx nearly equally 5-parted. Corolla upper lip entire or slightly 2-cleft, lower 3-cleft. Fertile stamens 2, mostly with 3 sterile filaments. Pod 2-celled, 4-valved, many-seeded.—Low herbs with opposite leaves. Peduncles axillary, 1-flowered, usually with 2 bracts near the calyx. *June—Aug.*

1 Flowers on peduncles. Plants weak, smooth or viscid....2
1 Flowers sessile or nearly so Plants rigid bristly-hairy S 7

2 Sterile filaments thread-like, tipped with a small head....3

2 Sterile filaments none, or very minute and pointed....6

3 Leaves entire or nearly so. Plants smooth....4

3 Leaves toothed. Plants generally viscid-downy. Flowers white....5

4 Stem erect. Lvs. lanceolate, clasping. Flowers whitish. *S*..G. officinàlis.

4 Stem ascending, branched. Leaves sessile. Fls. yellow, showy....G. aùrea.

5 Leaves ovate-lanceolate. Sepals and bracts lanceolate. *S*.....G. viscòsa.

5 Leaves lanceolate. Sepals and bracts awl-shaped. *S*....G. Drummóndii.

5 Leaves linear-lanceolate. Bracts minute. Sepals linear. *S*....G. ramòsa.

6 Peduncles not longer than calyx. Pod globular, obtuse. *W.* G. sphærocárpa.

6 Ped. long, slender. Cor. thrice longer than cal. Stem erect. *S.* G. Floridàna.

6 Ped. long, slend. Cor. twice longer than cal. Stem ascending. G. Virginiàna.

7 Lvs. ovate, toothed. Corolla scarcely longer than calyx. *S*....G. pilòsa.

7 Lvs. narrow, entire. Corolla thrice longer than calyx *S*.....G. subulàta.

4. VERON'ICA. Speed-well.

Calyx 4-parted. Corolla with a wheel-shaped, spreading, 4-cleft border, the lower segment smallest. Stamens 2, inserted into the tube, projecting. Sterile filaments 0. Pod flattened, mostly obtuse or notched at the apex, 2-celled, few- or many-seeded.—Mostly herbs, with opposite leaves. Flowers small, solitary, axillary, or racemed, blue, flesh-color or white. ***March—Sept.***

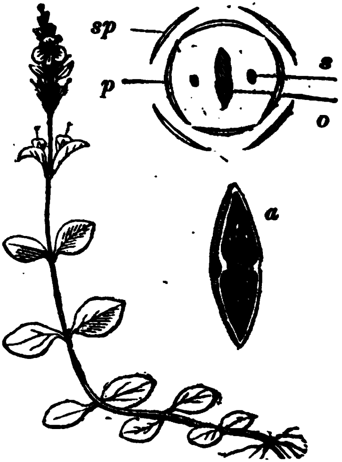


Fig. 240. Veronica serpyllifolia, whole plant. In the plan of the flower, *o*, is the 2-celled ovary; *s*, the 2 stamens; *p*, the 4 petals; *sp*, the 4 sepals; *a*, cross-section of the pod, showing its 2 cells, &c.

1 Erect, tall (1½—4f). Flowers in dense terminal spikes....5

1 Low, weak (3′—12′). Leaves opposite. Corolla tube very short....2

2 Racemes mostly opposite, from the axils of the leaves....6

2 Racemes mostly alternate, from the axils of the leaves....7

2 Racemes terminal, or the flowers axillary and not racemed....3

3 Floral leaves bract-like, longer than the erect peduncles....4
3 Flo. lvs. like the rest, not longer than recurved peduunc. Plants hairy....10
4 Plants almost glabrous. Pods roundish, with an obtuse notch....8
4 Plants quite hairy. Pods obcordate, with a deep, acute notch....9
5 Leaves whorled. Corolla tube longer than the limb......V. Virginiàna.
5 Leaves opposite. Corolla limb longer than the tube.†........V. spicàta.
6 Lvs. sessile, cordate-clasping, ovate-lanceolate. Fls. sky-blue. V. Anagállis.
6 Lvs. petiol., oblong-ovate, base round. or corda. Fls. sky-blue. V. Americàna.
7 Lvs. linear. Racemes very slender, loose, few-flowered... V. scutellàta.
7 Lvs. obov.-elliptic., finely and sharply serrate. Rac. dense. V. officinàlis.
8 Lvs. near entire, round-oval. Cor. pale, with deep blue lines. V. serpyllifòlia.
8 Lvs. toothed, oval-oblong, fleshy. Fls. nearly sessile, whitish. V. perigrìna.
9 Lvs. ovate, crenate. Bracts narr. Fls. nearly sessile, sky-blue. V. arvénsis.
9 Lvs. round-elliptical, entire or toothed. Fls. few, close, blue. *Mts.* V. alpìna.
10 Lvs. crenate-toothed. Sep. ovate-lanceolate. Ova. many-ovuled. V. agréstis.
10 Lvs. 3—5-toothed or lobed. Sep. triangul. Ova. 4-ovuled. V. hederæfòlia.

5. MIM'ULUS. Monkey-flower.

Calyx prismatic, 5-angled and 5-toothed. Corolla tubular, upper lip reflexed or erect, 2-lobed, lower lip spreading, with a prominent palate, 3-lobed. Pod 2-celled, many-seeded.—Herbs prostrate or erect, with square stems, opposite lvs., and axillary solitary fls. *July.*

1 Species found only in cultivation, in gardens....3
1 Species growing wild, in fields, road-sides, &c. Flowers blue....2
2 Stem not all winged. Lvs. sessile. Peduncles longer than fl. *c*..M. ríngens.
2 Stem slightly winged. Lvs. petiolate. Peduncles shorter than cal. M. alàtus.
3 Flowers yellow, often spotted. Leaves round-ovate, stalked.†...M. lùtea.
3 Fls. scarlet, large and brilliant. Leaves ovate. Stem erect.† M. cardinàlis.

6. CHELO'NE. Snake-head.

Calyx deeply 5-parted, or the sepals distinct. Corolla inflated, upper lip broad, concave, lower 3-lobed, bearded in the throat. Stamens 4, woolly, with a 5th sterile filament shorter than the others. Seeds many, broadly wing-margined.—♃ with opposite serrate leaves. *Aug.—Sept.*

Leaves lanceolate, petiolate. Fls. purple (A variety?). *W. M.*..C. purpùrea.
Leaves lanceolate, sessile or nearly so. Fls. white or purplish....C. glàbra.
Leaves ovate, petiolate, rarely cordate. Flowers purple or white. *S.*..C. Lyòni.

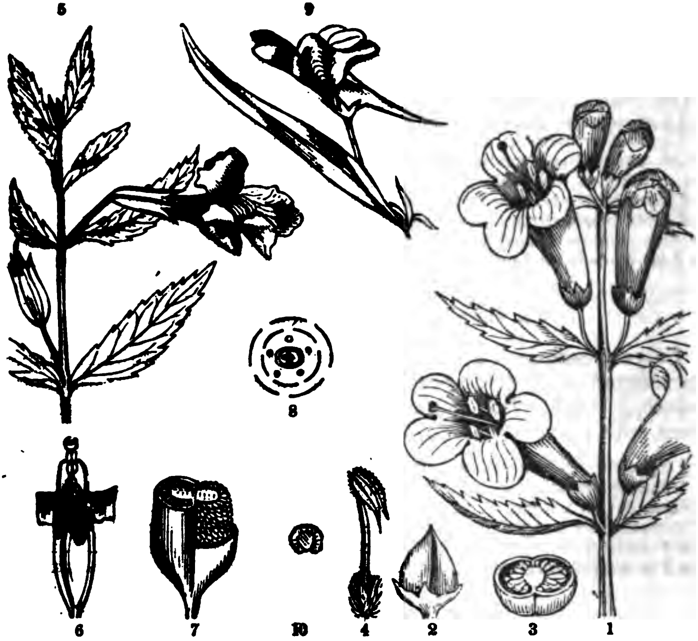


Fig. 239. 1, Dasystoma pubescens. 2, Mature fruit. 3, Cross section of the 2-celled capsule. 4, A stamen enlarged. 5, Mimulus ringens. 6, Calyx with the corolla partly removed, showing the didynamous stamens in pairs, with the stigma above the highest pair. 7, Sections of the 2-celled, many-seeded capsule. 8, Plan of the flower, showing the position of the fifth rudimentary filament. 9, Linaria vulgaris, leaf and personate-bilabiate, spurred flower. 10, A winged seed.

7. GERAR'DIA. PURPLE GERARDIA.

Calyx bell-shaped, 5-toothed, valvate in the bud. Corolla tubular, swelling above, with 5 unequal spreading lobes, which are shorter than the tube. Stamens 4, quite unequal by pairs, included, hairy. Pod ovate, pointed, many-seeded.—① Erect and branching herbs, with opposite, slender leaves and large, showy purple or rose-colored flowers. *July—Sept.*

1 Corolla purple. Plants dark green, turning blackish in drying....2
1 Corolla rose-white. Plants light green, not blackening in drying....6
2 Peduncles very short, not exceeding the calyx....3
2 Peduncles longer than the calyx, but not exceeding the flower....4
2 Peduncles longer than the flower, and often than the leaves....5
3 Lvs. linear, acute, rough-edged. Fls. nearly sessile, 1' long..G. PURPÙREA.
3 Lvs. linear, obtuse, fleshy. Fls. small, stalks long as cal. *E.* G. MARÍTIMA.
4 Stalks about twice longer than calyx. Sepals lanceolate. *W.*...G. ÁSPERA.
4 Stalks about thrice longer than calyx. Sepals minute........G. LINIFÒLIA.
5 Leaves linear, as long as the peduncles. Flowers smooth. G. TENUIFÒLIA.
5 Lvs. filiform, shorter than the peduncles. Flowers fringed..G. FILIFÒLIA.
6 Lvs. and sepals bristle-shaped. Pod ovate, longer than calyx. *S.*.G. SETÀCEA.
6 Lvs. none, white scales instead. Pod ovate, longer than cal. *S.*.G. APHÝLLA.
6 Lvs. linear (½'—1'), 1-veined. Pod round, as short as calyx. *W.* G. SKINNERIÀNA.

8. DASYS'TOMA. YELLOW GERARDIA.

The characters are the same as in GERARDIA, except that the calyx is 5-cleft, and imbricated in the early bud, the corolla yellow, with tube longer than the lobes and woolly inside, the leaves rather large, and mostly pinnatifid, and the root ♃. Flowers very showy. Plants 2—4f high. *July—Sept.*

1 Sepals finely toothed. Leaves all pinnatifid, with toothed lobes....4
1 Sepals entire. Leaves entire or mostly once pinnatifid-toothed....2
2 Glabrous. Leaves acute at apex, lanceolate in outline....3
2 Downy. Lvs. obtuse, entire except the lower. Sepals obtuse. D. PUBÉSCENS.
3 Glaucous. Lvs. mostly pinnatifid. Corolla 2' in length...D. QUERCIFÒLIA.
3 Green. Lvs. entire. Stalks shorter than cal. Fls. 1' long..D. INTEGRIFÒLIA.
4 Smoothish or downy, branched. Fl. stalks longer than cal...D. PEDICULÀRIA.
4 Very hairy. Lvs. pectinate-pinnat. Stalks shorter than cal. *S.*.D. PECTINÀTA.

ORDER 93. LABIA'TÆ.—LABIATE PLANTS.

Herbs with square stems, and opposite, aromatic leaves. *Flowers* axillary, in verticils, sometimes as if in spikes or heads. *Corolla* labiate (rarely regular), the upper lip 2-cleft or entire, overlapping in the *bud*, the lower 3-cleft lip. *Stamens* 4, didynamous, or 2. *Ovary* deeply 4-lobed, forming in *fruit* 4 hard nuts or achenia.

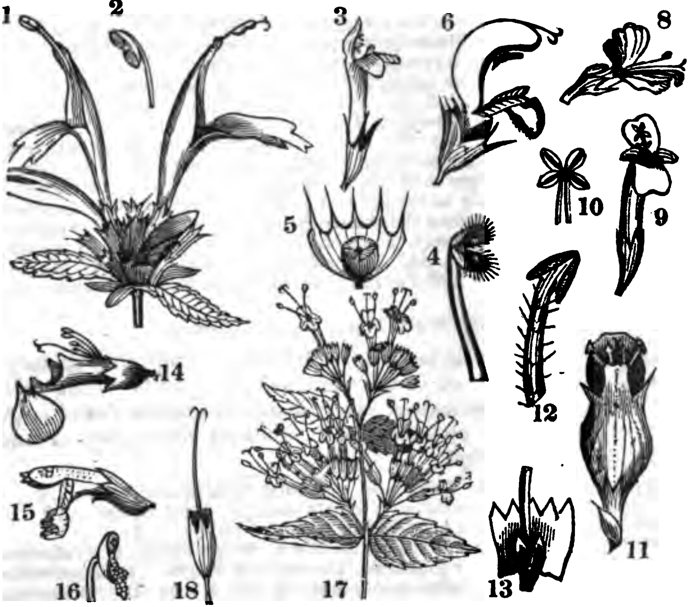


Fig. 241. 1, Monarda didyma. 2, An anther enlarged. 3, Fl. of Hemp Nettle (Galliopsis). 4, One of its stamens much enlarged. 5, The calyx opened, showing the 4 achenia. 6, Flower of Sage (Salvia). 8, Flower of Ocimum basilicum. 9, Flower of Nepeta Glechoma. 10, A pair of the anthers forming a cross. 11, Flower of Physostegia Virginica seen from beneath. 12, One of its stamens. 13. Its ovaries with the rudimentary filament. 14, Flower of Teucrium Canadense. 15, Flower Nepeta Cataria (Catnep). 16, One of its anthers. 17, Cunila Mariana (Dittany). 18, A calyx and style.

ANALYSIS OF THE GENERA.

1 Flowers with only 2 perfect stamens....8

1 Fls. with the 4 perfect stamens all declining towards the lower side....9

1 Flowers with the 4 perfect stamens not declining....2

2 Corolla nearly regular, with the four stamens equal....10

2 Corolla 2-lipped, with its upper pair of stamens longer....13

2 Corolla 2-lipped, with its lower pair of stamens longer....3

3 Stamens straight, standing apart. Cor. upper lip flattish....7

3 Stamens ascending by pairs beneath the concave or vaulted upper lip....4

3 Stamens ascending and far projecting (exserted) on the upper side....23

4 Calyx 2-lipped, upper lip truncate and closed in fruit....17

4 Calyx more or less 2-lipped, 5-toothed, 13-ribbed....16

4 Calyx nearly regular, 3—10-toothed, 5—10-ribbed or veiny....5

5 Calyx 3 or 4-toothed, the teeth not spinescent....18

5 Calyx 5-toothed or lobed, the teeth not spinescent....6

5 Calyx 5-toothed, the teeth ending in sharp spines....21

5 Calyx 6—10-toothed, 10-ribbed....22

6 Corolla much longer than the calyx, swollen and inflated....19

6 Corolla tube shorter than the calyx, and not inflated....20

7 Calyx hairy in the throat, mostly 2-lipped. Fls. in heads or spikes....14

7 Calyx not hairy in the throat, mostly equal, 5-toothed....15

8 Calyx quite irregular, 2-lipped....11

8 Calyx nearly regular, 5-toothed....12

9 Sta. included in long cor. tube, upper lip 2-lobed.†*Lavender.* LAVÁNDULA.

9 Sta. involved in the lower lip of the corolla, upper lip 2-lobed. *S.* HÝPTIS.

9 Sta. exserted. Cor. upper lip 4-lobed, lower entire.† *Sweet Basil.* OC'YMUM.

9 Sta. exser. Cor. gibbous at base. Shrubby.† *Sage Geranium.* PLECTRÁNTHUS.

10 Corolla limb 4-lobed, the broadest lobe notched. *Peppermint,* &c. MÉNTHA. 1

10 Corolla limb equally 5-lobed, blue. *Blue False Gentian*.......ISÁNTHUS.

11 Sta. long-exserted. Fls. yellow. Sts. branched. *HorseBalm.* COLLINSÒNIA.

11 Stamens exserted. Flowers purplish. Stems simple.......BLEPHÍLIA.

11 Stamens almost included. Anthers not halved. *Pennyroyal.* HEDEÒMA.

11 Sta. included under the lip, anth. halved, lobes separated. *Sage.* SÁLVIA.

12 Herbs with the cor. nearly regularly 4-lobed. *Water Horehound.* LÝCOPUS. 2

12 Herbs. Corolla slightly 2-lipped, stamens exserted...*Dittany*...CUNÌLA.

12 Hrbs. Cor. upper lip linear, involving filaments. *False Balm.* MONÁRDA. 3
12 Shrubs. Sta. ascending, with a tooth on upper side. *Rosemary.* ROSMARÌNA.
13 Lvs. crenate, cordate. Cor. tube very broad, hairy inside. CEDRONÉLLA.
13 Leaves crenate, cordate or reniform. Cor. tube smooth inside.. NÉPETA. 4
13 Lvs. serrate. Sta. all ascend. Fls. capitate. *Dragonhead.* DRACOCÉPHALUM.
13 Lvs. serrate. Stamens diverging. Fls. spiked. *Tall Hyssop.* LOPHÁNTHUS.
14 Cal. equal. 5-toothed. Lvs. hairy, ovate, acute. *W. Marjorum.* ORÍGANUM.
14 Cal. 2-lipped. Lvs. obov.-oval, obtuse, white-downy.† *Marjorum.* MAJORÀNA.
14 Cal. 2-lipped. Cor. up. lip erect. Lvs. green, ovate or narr. *Thyme.* THÝMUS.
15 Cal. about 13-ribbed. Fls. in close heads, often corymb. PYCNÁNTHEMUM.
15 Cal. 10-rib. Cymes axil. Fls. pale violet. Sta. short.† *Sum. Savory.* SATURÈJA.
15 Cal. 15-ribbed. Fls. axillary, blue. Stam. exserted. *Hyssop.* HISSÒPUS.
16 Flowers in close clusters, with awl-shaped bracts. Hairy... CLINOPÒDIUM.
16 Fls. loose. Calyx woolly in the throat. Smooth or downy.. CALAMÍNTHA.
16 Fls. loose. Calyx naked in the throat. Leaves hairy, crenate... MELÍSSA.
16 Fls. in terminal racemes. Peduncles oppos. Sta. exsert. *S.* CERÁNTHERA.
17 Cal. lips entire. Lower anths. halved. Fls. axil. or racem. SCUTELLÀRIA. 5
17 Calyx lips toothed. Filaments forked. Fls. in a short spike. PRUNÉLLA.
18 Cal. 4-toothed. Filaments bearded, upper anthers united. *W.*... SYNÁNDRA.
18 Calyx 2-toothed. Anthers bristle-fringed, 2-lobed. *S.*......... MACBRÍDEA.
19 Cor. tube inflated in the midst, whitish. Lvs. lanceolate. PHYSOSTÈGIA.
19 Corolla inflated at the throat, purple. Upper leaves clasping. LÀMIUM.
19 Corolla inflated in the large, vaulted upper lip, purple....... PHLÒMIS.
20 Cal. salver-form, 10-ribbed, as long as corolla. *Fœtid Horehound.* BALLÒTA.
20 Cal. broad bell-form, twice as large as corolla.† *Shell-flower.* MOLLUCÉLLA.
21 Lvs. palmately lobed. Anther valves not fringed. *Motherwort.* LEONÙRUS.
21 Lvs. serr. Cor. inflated in throat. Anths. bristly. *Hemp Nettle.* GALEÓPSIS.
21 Lvs. toothed or crenate. Cor. throat not inflated. *Hedge Nettle.* STÀCHYS.
22 Cal. 10-tooth. Lvs. crena.-toothed. Pl. white-downy. *Horehound.* MARRÚBIUM.
22 Calyx 6—10-toothed. Lvs. entire. Corolla upper lip bearded. *S.*.. LEUCAS.
23 Sta. very long, arching the 5-lobed corolla. *Blue-curls*.. TRICHOSTÈMA.
23 Sta. exserted through a fissure in the upper lip. *Germander*.. TEÙCRIUM.

1. MENTHA. MINT.

Calyx equally 5-toothed. **Corolla nearly regular, tube included in the calyx, border 4-cleft, the upper lobe mostly notched. Stamens 4,** equal, straight, erect, distant.—Aromatic herbs, with the pale purple or white flowers in close axillary clusters, or forming spikes.

1 Whorls of flowers remote, axillary, not in spikes. Lvs. petiolate....2
1 Whorls of flowers approximate, forming terminal spikes....3
2 Plant grayish, fragrant. Lvs. acute at each end. *Wild-mint.* M. Canadénsis.
2 Plant green, ill-scented. Lvs. frequently obtuse at base. *Field-m.* M. arvénsis.
3 Leaves petiolate. Spikes few, thick, short..*Peppermint*......M. piperìta.
3 Leaves sessile. Spikes many, slender, long.....*Spearmint*....M. víridis.

2. LY'COPUS. Water Horehound.

Calyx tubular, 4—5-cleft. Corolla nearly regular, 4-cleft, tube as long as the calyx, stamens 2, distant, diverging, the length of the straight style.—♃ Low herbs with deeply toothed or pinnatifid leaves, and remote axillary whorls of small, whitish flowers. *Jl.*, *Aug.*

Stem obtuse-angled. Lvs. sharp-toothed. Calyx 4-cleft, blunt. L. Virgínicus.
Stem sharp-angled. Lvs. sinuate-toothed. Calyx 5-cleft, spiny..L. sinuàtus.

3. MONAR'DA. Mountain-mint.

Calyx tubular, lengthened, 15-ribbed, nearly equally 5-toothed. Corolla tubular, long, the lips linear or oblong, lower reflexed, 3-lobed, upper erect, entire, involving the filaments. Stamens 2, with rudiments of more.—Erect, fragrant herbs, with rather large flowers in bracted whorls or heads, the bracts generally tinged with the color of the flowers. *July—Sept.*

1 Leaves abrupt at base. Stamens and style exceeding the upper lip....2
1 Leaves tapering to the base. Stamens not exceeding the upper lip....3
2 Lvs. petiolate, ovate. Cor. bright red, 2′ long. Bracts reddish. M. dídyma.
2 Lvs. petiol., lance-ovate. Cor. purpl. or whitish (very variab.). M. fistulòsa.
2 Lvs. sessile, hairy. Cor. pale purple. Calyx teeth spiny. *W.* M. Bradburiàna.
3 Downy. Lvs. and bracts lanceolate. Cor. yellowish, spotted. M. punctàta.
3 Very glabrous. Lvs. and bracts lance-lin. Cor. yellowish. *S.* M. grácilis.

4. NEP'ETA. Cat-mint.

Calyx striate, obliquely 5-toothed. Upper lip of the corolla notched or 2-cleft, lower 3-lobed, middle lobe largest, throat naked and widened. Stamens ascending beneath the upper lip.—♃ Leaves

Cymes dense, forming terminal spikes. Lvs. cordate ovate. Erect. N. CATÀRIA.
Cymes loose, axillary. Leaves round-reniform. Trailing. *Gill.* N. GLECHÒMA.

5. SCUTELLA'RIA. SCULL-CAP.

Calyx campanulate, lips entire, with an appendage on the back and closed after flowering. Corolla with a long, ascending tube, the upper lip vaulted, nearly entire, middle lobe of the lower lip wide, spreading. Stamens approximate in pairs, ascending beneath upper lip.—Bitter herbs, not aromatic. Flowers generally blue. *May—Aug.*

1 Flowers in racemes, the floral leaves reduced to mere bracts....2
1 Flowers solitary, axillary. Leaves all similar, nearly sessile....5
2 Racemes terminal. Leaves petiolate. Flowers blue....3
2 Racemes axillary, and sometimes also terminal. Flowers small....6
3 Plants hairy, or clothed with soft down, often whitish....4
3 Plants smooth or very nearly so. Racemes loose, leafy at base....8
4 Tall, erect (2—4f). Leaves mostly acute at apex, abrupt at base....9
4 Stems 1—2f high. Leaves rather obtuse at the apex....7
5 Hight 1—2f. Lvs. ovate-lanceo., acute, serr. Cor. large. S. GALERICULÀTA.
5 Hight 3′—10′. Lvs. round., lance-ovate, obtuse, entire, small. S. PÁRVULA.
5 Hight 10′—20′. Lvs. lin., minutely pubes. Sts. simple. *S.*. S. ANGUSTIFÒLIA.
6 Lvs. broad-ovate, 3—5-veined, subsessile. Fls. few, opposite...S. NERVÒSA.
6 Lvs. ovate, pointed, thin, petiolate. Fls. many, one-sided...S. LATERIFLÒRA.
7 Hairy. Lvs. rhomb.-ovate, distant, bracts spatul. Rac. short. *S.M.* S. PILÒSA.
7 Wool-downy. Lvs.oval-ova.,bracts ovate,petiolate.Rac.long. *SM.* S.RUGÒSA.
7 White-downy. Lvs. entire, lanceo. or lin.,obtuse. Rac. leafy. S. INTEGRIFÒLIA.
8 Lvs. acute, serrate, all tapering into pet.; bracts lanceolate. *S-W.* S. SERRÀTA.
8 Lvs. obtuse, crenate, ovate-corda.; bracts oblong. Sts. ascend. *W.* S. SAXÁTILIS.
9 Velvety. Lvs. obtuse or cordate at base; bracts oblong. *W.M.* S. CANÉSCENS.
9 Hairy. Lvs. deep-cordate at base; bracts ovate,sessile. *S-W.* S. VERSÍCOLOR.

ORDER 94. BORRAGINA'CEÆ.—BORRAGEWORTS.

Herbs, *shrubs* or *trees* with round stems and branches.

Leaves alternate, generally rough with stiff hairs. *Stipules* none.

Flowers seldom yellow, generally in a coiled (circinate) inflorescence.

Sepals 5. *Petals* 5, united below, almost always regular.

Stamens 5. *Ovary* deeply 4-lobed, forming in fruit 4 separate 1-seeded *nuts* or nutlets, generally without albumen.

ANALYSIS OF THE GENERA.

1 Corolla open at the throat, without scales....2
1 Corolla closed at the throat, with 5 little scales....3
2 Flowers blue or purple....8
2 Flowers white or yellow....9
3 Ovary and fruit smooth....4
3 Ovary and fruit prickly....7
4 Corolla funnel-form. Nuts excavated at the base....5
4 Corolla salver-form. Nuts flattish at the base....6
4 Cor. wheel-form, blue. Sta. converging. (See Fig.)† *Borrage*....Borràgo.
4 Cor. tube-bell-form, whitish. Stam. included.† *Comfrey.* Sỳmphytum *officin.*
5 Tube of the corolla straight.†.... *Garden Bugloss*...Anchùsa *officinàlis.*
5 Tube of the corolla curved......... *Wild Bugloss*....Lycópsis *arvénsis.*
6 Flowers yellow, large. Nut white, smooth.. *W.* Pentálophus *longiflòrus.*
6 Fls. white or blue, small, lobes a little notched.. *Forget-me-not*.. Myosótis. 1
7 Cor. salver-form, blue. Nuts prickly in rows. *Burr-seed.* Echinospérmum.
7 Cor. funnel-form, purp., &c. Nuts prickly. *Hound-tongue.* Cynoglóssum. 2
8 Cor. irregular, violet-purp. Sta. exserted. *Viper's Bugloss.* Echium *vulgàre.*
8 Cor. regular, blue, tube-bell-form. Leaves smooth. *Lungwort.* Merténsia.
8 Cor. reg., blue, funnel-form. Lvs. rough.† *Lungwort.* Pulmonària *officinà.*
9 Cor. oblong-tubular. Style long exserted. *False Gromwell.* Onosmòdium. 3
9 Cor. funnel-form, sometimes yell. Nuts bony. *Gromwell.* Lithospèrmum. 4
9 Cor. salver-form, white. Style at top of ovary. *Turnsol.* Heliotròpium.

1. MYOSO'TIS. Forget-me-not. Scorpion-Grass.

Calyx 5-cleft. Corolla salver-form, the 5 lobes slightly notched at the end, throat closed with 5 short, concave scales. Nuts smooth, ovate, with a small cavity at base.—Little herbs slightly woolly. Racemes finally becoming long. *May—Aug.*

Corolla bluish white, very small. Leaves oblong. Hight 6′—10′. M. stricta.
Corolla bright blue, yellow in centre. Leaves oblong-linear.........M. laxa.

2. CYNOGLOS'SUM. Hound's-tongue.

Calyx 5-parted. Corolla short, funnel-form, the throat closed with 5 obtuse scales, lobes rounded. Nuts depressed, covered with

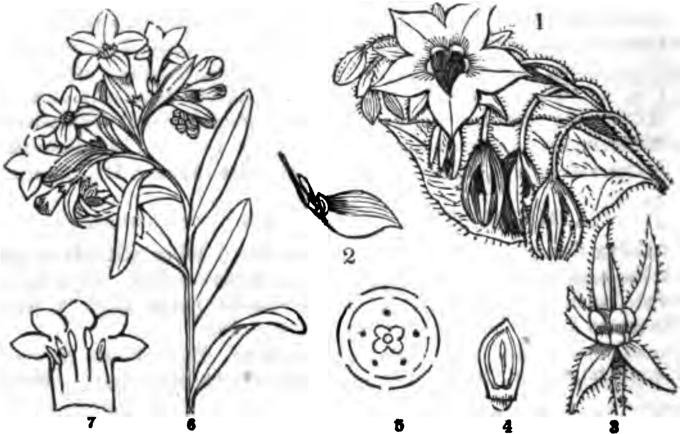
short, hooked prickles, fixed laterally to the base of the style.—Coarse herbs, strong-scented, with the flowers in leafless, panicled racemes. *June, July.*

Velvety. Stem leafy (1—2f). Flowers reddish purple.........C. OFFICINÀLE.
Hairy. Stem leafless above (2f). Flowers pale blue.........C. VIRGÍNICUM.
Hairy. Stem leafy (2—3f), wide-spread. Fls. whitish.........C. MORISÒNI.

3. ONOSMO'DIUM. FALSE GROMWELL.

Calyx deeply 5-parted, with linear segments. Corolla oblong-tubular, half-5-cleft, segments erect and the throat open. Anthers sessile, included, style long exserted, smooth. Nuts shining, fixed by a flat base—♃ with spiked, one-sided racemes of white flowers. *June—Aug.*

Close-bristly (1—2f). Corolla short, lobes slender..........O. VIRGINIÀNUM.
Shaggy-hairy (3—4f). Corolla twice longer than calyx.....O. CAROLINIÀNUM.
Close-downy (1—2f). Cor. lobes short, acute. Lvs obtuse. ....O. MOLLE.



242. Borrage (Borrago officinalis). 2, A petal with its scale and attached stamen. 3, Nuts with the style and calyx. 4, One of the nuts cut open, showing the seed, embryo, &c. 5, Plan of the flower. 6, Puccoon (Lithospermum canescens). 7, Corolla laid open, showing the stamens.

4. LITHOSPER'MUM. GROMWELL.

Calyx 5-parted. Corolla funnel-form or salver-form, the limb 5-lobed, throat open. Stamens included. Nuts bony, ovate, smooth or wrinkled, fixed by a flat base.—Herbs generally with thick, reddish roots. Flowers spiked or racemed, with leafy bracts. *May—July.*

1 Flowers white or yellowish white....2
1 Flowers bright yellow, showy....3
2 Root ①, red. Leaves lance-linear. Nuts wrinkled, rough......C. ARVÉNSE.
2 Root ♃. Lvs. broad-lanceolate. Nuts smooth and polished...C. OFFICINÀLE.
2 Root ♃. Lvs. ovate-lanceolate. Nuts smooth, punctate......C. LATIFÒLIUM.
3 Rough-hairy. Lvs. lance-linear. Cor. as long as calyx.......C. HIRTUM.
3 Hoary-downy. Lvs. oblong. Cor. thrice longer than calyx...C. CANÉSCENS.

ORDER 95. HYDROPHYLLA'CEÆ.—HYDROPHYLLS.

Mostly *herbs* with alterate lobed *leaves*, and regular bluish *flowers.* *Calyx* 5-cleft, usually with appendages at the clefts, persistent. *Corolla* 5-lobed, often with 10 honey scales or furrows near the base. *Stamens* 5, inserted into the corolla, with a single bifid style. *Ovary* simple, free, 1-celled, with 2 usually projecting several-seeded placentæ.

ANALYSIS OF THE GENERA.

1 Corolla with 10 honey scales inside, extending lengthwise....2
1 Cor. destitute of honey scales. Stamens equalling corolla. COSMÁNTHUS.
2 Fls. in coiled cymes, without bracts. Placentæ large, fleshy. HYDROPHÝLLUM. 1
2 Flowers in one-sided racemes, bractless. Placentæ linear......PHACÈLIA.
2 Fls. (mostly) solitary. Calyx very large. Leaves pinnatifid......ELLÍSIA.

1. HYDROPHYL'LUM.

Sepals slightly united at base. Corolla campanulate, with 10 linear honey scales running lengthwise, folded inward so as to form 5 grooves. Stamens exserted. Pod globular, 2-celled. 1—4-seeded, with large, fleshy placentæ.—Handsome herbs, with the root leaves on long petioles, and the flowers in clustered cymes, bluish or white.

1 Calyx not appendaged. Stamens much exserted....2

1 Cal. appendaged at the clefts. Sta. not exserted. *W.S.* H. APPENDICULÀTUM.

2 Lvs. pinn.-veined and lobed, r'gh-hairy. Pedun. long. *W.S.* H. MACROPHÝLLUM.

2 Lvs. pinnately-veined and lobed, smooth. Peduncles long. *c.* H. VIRGÍNICUM.

2 Lvs. palmat.-vein'd and lob'd, smooth. Ped. shorter than pets.*r.* H. CANADÉNSE.

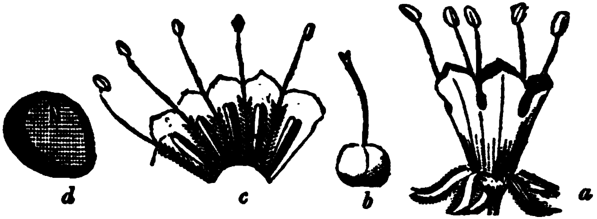


Fig. 242. Hydrophyllum Virginicum. *a*, A flower (enlarged). *b*. The ovary and style. *c*, Corolla laid open, showing the stamens, and the linear honey scales. *d*, A large seed cut open, with its little embryo.

ORDER 96. POLEMONIA'CEÆ.—PHLOXWORTS.

Herbs with alternate or opposite leaves, and regular, showy, 5-parted *flowers*, *calyx* free from the ovary, *corolla* of 5 united petals, twisted and imbricate in the bud, *stamens* 5, inserted into the midst of the corolla tube and alternate with its lobes, *ovary* 3-celled, styles united into 1, stigma 3'-cleft, *capsule* 3-celled, 3-valved, with few or many albuminous seeds.

ANALYSIS OF THE GENERA.

Corolla salver-shaped. Stamens unequally inserted within the tube. PHLOX. 1

Corolla funnel-shaped. Stamens equally inserted at top of the tube..GÍLIA.

Cor. bell-shaped. Stamen valves closing the bottom of the tube. POLEMÒNIUM.

1. PHLOX. LYCHNIDEA.

Calyx angular, deeply 5-cleft, corolla salver-form, the tube more or less curved. Stamens quite unequal, inserted in the tube of the corolla above the middle. Capsule 3-celled, cells 1-seeded.—Very beautiful North American herbs. Leaves generally opposite, sessile, simple, entire. Flowers varying from purple to white. *Ap.–Jl.*

1 Lobes of the corolla (petals) rounded and entire at the apex....2
1 Lobes of the corolla notched or 2-cleft at the apex....9
2 Fls. many, in a cone-shaped or oblong panicle. Cal. short. Plants erect....5
2 Fls. fewer, somewhat corymbed. Plants creeping, ascending or erect....3
3 Plants very smooth and glabrous. Cal. teeth short-pointed, not bristly....6
3 Plants hairy or downy, especially the long-toothed calyx....4
4 Leaves linear or lance-linear, acuminate-pointed....7
4 Leaves oblong or lance-ovate, obtuse or scarcely acute....8
5 Smooth. Lvs. tapering to both ends. Panicle roundish. *W.S.*† P. PANICULÀTA.
5 Downy. Lvs. acumin. Cal. awn-toothed. Pan. cone-shaped. *S.*† P. ACUMINÀTA.
5 St. spotted. Lvs. broad at base. Cal. very short. Pan. oblong. *S.*† P. MACULÀTA.
6 Lvs. lance-ovate, acute, thin. Sepals united half-way up. *W.S.* P. CAROLÌNA.
6 Lvs. lance-linear, acumin., thick. Cal. teeth quite short. *W*—P. GLABÉRRIMA.
7 Cal. teeth revolute. Lvs. broadest at base, often alternate.† P. DRUMMÓNDII.
7 Calyx erect. Leaves narrowed to the clasping base. *W.M.S.*....P. PILÒSA.
8 Hairy, low, with prostrate runners. Lvs. small, oblong. *W.S.*†..P. RÉPTANS.
8 Downy, erect, slender. Leaves thin, broadest at base. *W.*.....P. LAPHÀMI.
9 Lvs. lance-ovate, thin. Petals merely notched. St. inclined. P. DIVARICÀTA.
9 Lvs. lance-linear, thick. Petals deeply 2-cleft. Stem low. *W.*...P. BÍFIDA.
9 Trailing, forming tufts. Lvs. linear-awl-shaped, stiff, fringed. P. SUBULÀTA.

ORDER 98. CONVOLVULA'CEÆ.—BINDWEEDS.

Herbs twining or trailing, with alternate leaves and large showy flowers, *calyx* with 5 much imbricated sepals, persistent,
corolla regular, 5-lobed or entire, plaited and twisted in the bud,
stamens 5, and *style* single, *ovary* free, becoming in
fruit a pod which is 2—4-celled and 2—6-seeded,
embryo large and leafy, with thin mucilaginous albumen.

The Suborder, Cuscuteæ, consists of small orange-colored, leafless plants, living on other plants (parasites), with small flowers, and no cotyledons!

ANALYSIS OF THE GENERA.

1 Plants leafy, green. Cotyledons 2, leafy, large....2
1 Plants leafless, orange-col'd. Cotyl. none. Parasitic. *Dodder*. CUSCÙTA.
2 Stamens exserted (projecting beyond the corolla)....3

3 Calyx enclosed within 2 large leafy bracts. *Rutland Beauty*. CALYSTEGIA.
3 Cal. naked. Sty. wholly united into one. *Morn. Glory, &c.* CONVÓLVULUS, 1
3 Cal. naked. Styles 2 or 3, nearly separate. Stem trailing. *W.S.* STYLÍSMA,
4 Cor. tubular-cylindri., scarlet-col'd. Pod 4-celled. *Cypress-vine*. QUÁMOCLIT.
4 Cor. funnel-form. Pod 2- or partly 4-celled. *S. Good-night*..CALONÝCTION.

1. CONVOLVÚLUS. BIND-WEED. MORNING-GLORY.

Calyx naked (not enclosed in bracts). Corolla bell- or funnel-form, with a spreading, nearly entire, 5-plaited border. Stamens mostly included. Ovary 2—4-celled, cells 1—2-ovuled. Style 1, stigmas 1, 2 or 3.—Mostly twining or trailing plants, often with a milky juice. *June—Sept.*

1 Stigmas 2, slender, ovary and pod 2-celled....6
1 Stigmas 2, globular, or united into 1. Pod 2 celled....2
1 Stigmas 3, united into 1 granulated head. Pod or ovary 3-celled....7
1 Stigma 2-lobed, globular. Pod or the ovary 4-celled....8
2 Corolla yellow or white, the tube sometimes purple inside....5
2 Corolla either blue or purple....3
3 Lvs. either entire or 3-lobed, cordate at base....4
3 Lvs. roundish, notched or 2-lobed at the end. Fls. purple..C. PES-CÀPRÆ.
3 Lvs. digitate, 5—7-lobed, lobes petioled. Pedun. 1-flowered. C. CAROLÌNUS.
4 Pedun. 1—2 flow'd. Lvs. smooth, arrow-shaped. Stem smooth. C. SAGITTÀTUS.
4 Pedun. 3—4 fl'd. Lvs. downy, entire or 3-lobed. Stem downy. C. COMMUTÀTUS.
4 Ped. bearing hds. of fls. with lin. bracts. Fls. blue. St. hairy. C. TAMNIFÒLIUS.
5 Stem smooth. Lvs. cordate, acuminate. Fls. yellow, showy..C. CILIÒSUS.
5 St. hairy. Lvs. smooth, 7-lobed. Fls. white, little longer than cal. C. SINUÀTUS.
5 St. whitish-downy. Lvs. numer., lin. Fls. white, small. *M.S.* C. PICKERÍNGII.
5 St. smoothish. Lvs. entire or 3-lobed. Fls. white, small. *W.S.* C. LACUNÒSUS.
5 St. smooth. Lvs. often lobed. Fls. purp. in tube, limb white. C. PANDURÀTUS.
6 Stem trailing. Lvs. arrow-shaped. Fls. white, 2 bracts below. C. ARVÉNSIS.
6 St. hairy. Lvs. lance-obovate. Fls. 3-colored (blue, white, yel.).† C. TRÍCOLOR.
7 St. hairy. Lvs. broad-cordate, entire. Fls. purp., large. *S.*†..C. PURPÙREUS.
7 Stem hairy. Leaves cordate, 3-lobed. Flowers white-purple.†....C. NIL.
8 Leaves downy beneath, lobed or not. Flowers rose-white. *S.W.*..C. JALÀPA.
8 Leaves smooth, obtusely lobed. Flowers yellowish-white. *S.*..C. LITTORÀLIS.
8 Lvs. hastate, angular, 5-veined. Fls. purp. or white. *Sweet Potato*. C. BATÀTAS.

ORDER 99. SOLANACEÆ.—NIGHTSHADES.

Plants herbaceous or shrubby, with alternate leaves, and with *flower-stalks* often opposite to the leaves and the pedicels without bracts, *calyx* generally persistent, 5-lobed, *corolla* 5-lobed, mostly regular, valvate and plaited in the bud; *ovary* free, 2-celled (rarely 3- or 4-celled), many seeded. *Style* and *stigma* single. *Fruit* a capsule or berry, with many seeds. *Embryo* curved, lying in fleshy albumen.

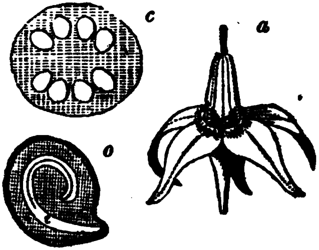


Fig. 244. *a*, A flower of Solanum Dulcamara (Bitter-sweet). *c*, Cross section of the berry. *o*, A seed cut open, showing the long curved embryo.

ANALYSIS OF THE GENERA.

1 Corolla regular, the lobes all equal....2
1 Corolla somewhat irregular. Stamens standing apart....3
2 Corolla wheel-shaped, tube very short. Stamens converging....6
2 Corolla funnel-shaped, tube long. Stamens standing apart....4
2 Corolla bell-shaped, the tube broad at the mouth....5
3 Cor. salver-form, white or purp., lower lobe largest. Trailing.† PETÙNIA.
3 Cor. funnel-form, yellow, purp.-veined, upper lobe largest. HYOSCỲAMUS.
3 Cor. wheel-form, lip-shaped, sta. declined, one horn-like. *S.* ANDRÓCERA.
4 Herbs. Fruit prickly. Cor. large, white or purple. *Stramonium.* DATÙRA.
4 Herbs. Fruit smooth. Cor. slender, yellowish or pink. *Tobacco.* NICOTIÀNA.
4 Shbs. with long, trailing branches. Berry 2-celled. *Matrimony Vine.* LÝCIUM.
5 Sepals lanceolate, spreading in fruit. Berry naked. *Belladonna.* AT′ROPA.
5 Seps. arrow-shaped, leafy, enclosing the berry. *Apple of Peru.* NICÁNDRA.
6 Berry sitting on the spreading cal. Anth. open'g at top. *Potato, &c.* SOLÀNUM. 1
6 Berry enclosed in the bladdery calyx. Anth. splitting at side...PHÝSALIS.
6 Fruit a dry pod, very acrid. *Cayenne* or *Red Pepper.*‡.........CÁPSICUM.

1. SOLA'NUM. Potato, &c.

Calyx 5—10-parted. Corolla rotate, limb spreading, tube very short, limb plaited in the bud, 5—10-lobed. Anthers erect, slightly united or converging, each opening at top by 2 pores. Berry 2—6-celled.—Herbs or shrubs unarmed or prickly. Leaves often 2-together, a large and a small one. Fls. generally lateral. *May—July.*

1 Herbs with the stem and leaves prickly....3
1 Herbs with the stem and leaves not prickly....2
1 Shrubs without prickles, smoothish....4
2 Leaves pinnate or pinnatifid....5
2 Leaves entire or merely waved on the margin....6
3 Flowers white or yellow....7
3 Flowers blue or purple....8
4 Stems long, trailing. Fls. clustered, purple. *Bitter-sweet*....S. Dulcamára.
4 Stem erect. Fls. solitary, white.† *Jerusalem Cherry*....S. Pseudo-Cápsicum.
5 Flowers bluish. Berries 2-celled. Root tuberous. *Potato*..S. tuberòsum.
5 Fls. greenish. Ber. large, 3—6-celled, colored. *Tomato*. S. Lycospérsicum.
6 Smoothish. Lvs. ovate. Fls. white, ber. black. *Black Nightshade*. S. nìgrum.
6 Hairy. Lvs. obovate, obtuse. Flowers purple. Plant small. *S*. S. hirsùtum.
7 Leaves cordate, angular-lobed. Flowers yellow. *S*........S. mammòsum.
7 Lvs. not corda., angul.-lobed. Fls. white. *S. W. Horse-nettle*. S. Carolinénse.
8 Leaves pinnatifid, prickly both sides. Calyx prickly. *S*....S. Virginiànum.
8 Lvs. ovate, downy. Calyx not prickly. Fr. large. *Egg-plant*. S. Melongèna.

Order 100. GENTIANA'CEÆ.—Gentianworts.

Herbs with opposite, entire, smooth *leaves*, and showy, regular *flowers*; *corolla* usually twisted in the bud, with as many lobes as *stamens*, and alternate with them, mostly persistent and withering; stigmas 1 or 2; *ovary* 1-celled, superior, becoming a 2-valved pod with many seeds.

ANALYSIS OF THE GENERA.

1 Lvs. opposite or whorled, sometimes minute. Cor. mostly twisted in bud..2
1 Lvs. alternate or radical. Corolla valvate in the bud....7
2 Corolla with a glandular spot on each lobe, sometimes with spurs....6
2 Corolla without glandular spots or spurs....3

3 Corolla tubular, the tube longer than the limb....4
3 Corolla deeply cleft, mostly wheel-shaped, tube very short....5
4 Seps. 4 or 5. Cor. fringed, or with folds betw. lobes. Anths. str'ght. **GENTIÀNA.** 1
4 Sepals 4 or 5. Anthers spirally twisted. *European Centaury.* **ERYTHRÆ'A.**
4 Sepals 2, leaf-like. Cor. 4-cleft, white or purplish. *Pennywort.* **OBOLÀRIA.**
5 Leaves very small or mere bracts. Fls. 4-parted. *Screw-stem.* **BARTÒNIA.**
5 Leafy. Fls. 5—12-parted. Anthers curved. *American Centaury.* **SABBÀTIA.** 2
6 Cor. 4-parted, with 4 spurs beneath at base. *Spurred Gentian*...**HALÈNIA.**
6 Cor. 4-parted, without spurs. Pl. tall, with whorled lvs. *Columbo.* **FRASÈRA.**
7 Cor. bearded inside. Lvs. 3-folia., on long stalks. *Buck-bean.* **MENYÀNTHES.**
7 Cor. smooth inside. Lvs. simple, floating. *Floating Heart.* **LIMNÀNTHEMUM.**

1. GENTIA'NA. Gentian.

Calyx 4—5-cleft. Corolla, 4—5-lobed, regular, usually with plaited folds between the lobes. Stigmas 2, style short or none. Pod oblong, 2-valved, many-seeded.—Leaves opposite. Fls. solitary or in cymes. *Aug.—Oct.*

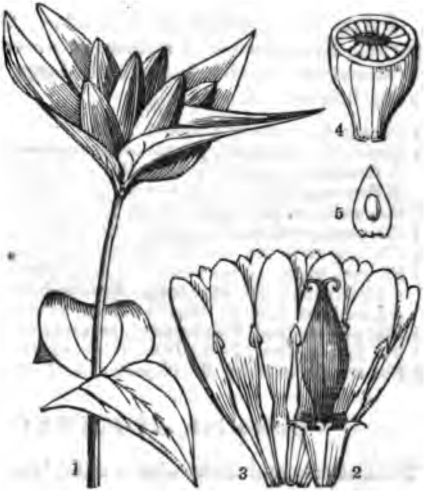


Fig. 245. 1, Gentiana Andrewsii. 2, The calyx and capsule. 3, The corolla laid open, showing the folds (2-lobed) between the proper petals, and the stamens attached at base. 4, Capsule cut across. 5, Seed magnified, with its large, loose testa.

1 Flowers 5—10-parted, whitish or yellow....7
1 Flowers 5—10-parted, blue or purple....2
1 Flowers 4-parted, lobes fringed, blue....3
2 Corolla club-shaped, lobes with folds between them....5
2 Corolla funnel-form, lobes with folds between them. Lvs linear....6

3 Up. lvs. ovate, connate-clasping, acute, rough-edged. Cal. long. *S.* G. ACÙTA.
3 Lvs. cordate, not connate, 5–7-v'ned, smo'h-edg., Cal. short. G. QUINQUEFLÒRA
4 Cor. lobes never opening. Cal. lobes ovate. Lvs. lance-ovate. S. ANDRÉWSII.
4 Cor. lobes slightly open. Cal. lobes lin. Lvs. broad or narrow. S. SAPONÀRIA.
5 Fls. clustered. Folds of cor. entire. Pod finally stalked. S. PNEUMONÁNTHE.
5 Fl. 1 only, terminal. Folds of the cor. toothed. Pod stalked. S. ANGUSTIFÒLIA.
6 Cor. whitish. Lvs. all narrowed to the base. Seed wingless. S. OCHROLEÙCA.
6 Corolla whitish. Leaves heart-clasping at base. Seeds winged....G. ÁLBA.
6 Cor. yellow. Lvs. ovate or oval. Cor. spreading, without folds...G. LÙTEA.
7 Leaves lance-ovate. Cor. lobes deeply fringed, wedge-obovate. G. CRINÌTA.
7 Lvs. lance-linear. Cor. lobes slightly fringed, oblong-spatulate. G. DETÓNSA.

2. SABBA'TIA. AMERICAN CENTAURY.

Calyx 5—12-parted, lobes slender. **Corolla** wheel-shaped, 5—12-parted. **Stamens** 5—12, anthers recurved. **Style** slender, 2-parted.—② Beautiful slender herbs, with large, panicled or cymose rose or white flowers. *June—Aug.*

1 Corolla 5- or rarely 6-parted....2
1 Corolla 7—12-parted, purple or rose-colored....5
2 Branches opposite, several-flowered, peduncles short....3
2 Branches alternate or forked, peduncles slender, 1-flr'd. Fls. purp.-yel...4
3 Fls. white, in flat-topped cyme. Lvs. lance-ova. St. simp. *S-E.* S. CORYMBÒSA.
3 Fls. purp., with a greenish star. St. square. Lvs. ovate-clasping. S. ANGULÀRIS.
3 Fls. rose, with yel. star. St. slender. Lvs. lance-linear, sessile. *W.* S. CONCÍNNA.
3 Flowers purple, numerous, in a long, narrow panicle. *S.*....S. BRACHIÀTA.
4 Lvs. lance-ovate or oblong. Sepals shorter than the petals...S. STELLÀRIS.
4 Lvs. lance-linear. Sepals as long as the petals, bristle-form..S. GRÁCILIS.
5 Fls. long-stalked, 9—11-parted, petals large, longer than seps. S. CHLOROÌDES.
5 Fls. long-stalked, 7—9-parted, petals shorter than the sepals....S. CALYCÒSA.
5 Fls. sessile, axillary, 9—12-parted. Lvs. linear, long. *S.*....S. GENTIANOÌDES.

ORDER 101. APOCYNA'CEÆ.—DOGBANES.

Trees, *shrubs* and *herbs* with a milky juice, entire leaves, *flowers* 5-parted and regular, with the *corolla* twisted in the bud, *stamens* 5, with distinct filaments, anthers sometimes slightly united, *ovaries* 2, distinct, but with their stigmas united at top of the styles, *fruit* 2 follicles containing several or many albuminous seeds.

ANALYSIS OF THE GENERA.

1 Herbs erect, with white or blush-colored fls. Seeds silky ....APÓCYNUM. 1
1 Herbs erect, with blue fls. Cor. tube closed. Sds. naked. *S. W*..AMSÒNIA.
1 Herbs climbing, with white and yellow fls. Seeds silky. *S*....ECHÌTES.
2 Shrubs with opposite leaves and bluish-purple fls.†..*Periwinkle*....VÍNCA.
2 Shrubs with lvs. in whorls of 3s, and large rose-red fls. *Oleander*. NÈRIUM.

APO'CYNUM. DOG'S-BANE.

Calyx very small, corolla campanulate, lobes short. Stamens shorter than the corolla, arising from its base and alternate with 5 glandular teeth. Anthers arrow-shaped, cohering to the stigmas by the middle. Ovaries 2. Follicles long, slender, separate. Seeds with a tuft of long, silky down.—Herbs with opposite entire leaves, and small flowers in cymes. *Jn.—Aug.*

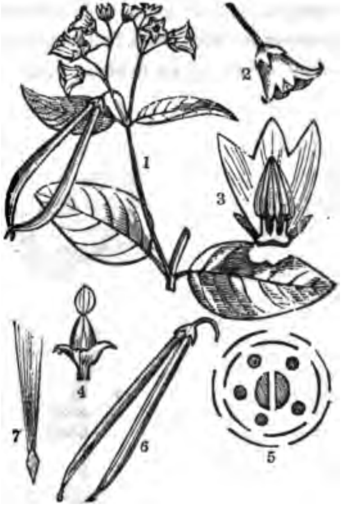


Fig. 246. 1, Apocynum androsæmifolium. 2, A flower of the natural size. 3, The flower cut open, showing the peculiar stamens. 4, The 2 styles and stigmas. 5, The plan of the flower. 6, The 2 follicles. 7, A seed with its tuft of silk.

1 Corolla greenish-white, but little longer than calyx. Leaves oblong....2
1 Cor. rose-white, much longer than cal. Lvs. ovate. A. ANDROSÆMIFÒLIUM.
2 Lvs. obtuse at each end, petiolate, often downy beneath.....A. CANNABÌNUM.
2 Lvs. cordate, almost sessile, acute, upper acute both ends. A. HYPERICIFÒLIUM.

ORDER 102. ASCLEPIADA'CEÆ.—ASCLEPIADS.

Plants **(chiefly *herbs* in the United States) with a milky juice,**
leaves **opposite (rarely whorled or scattered), entire, without stipules,**
flowers **generally umbeled, 5-parted, regular, *sepals* and also the**
petals **united at base, both commonly valvate in the bud,**
stamens **united, with the anthers covering over the two stigmas,**
pollen **cohering in masses, *ovaries* 2, forming *follicles* in fruit.**

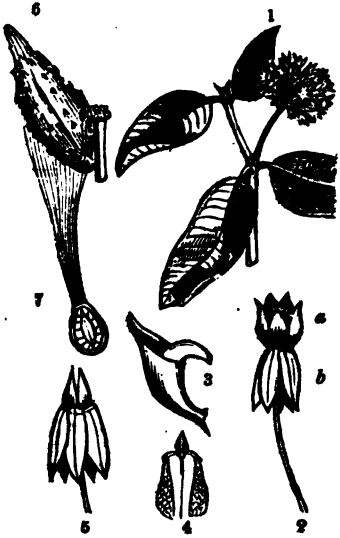


Fig. 247. 1, Asclepias Cornuti. 2, A single flower; *a*, the crown, *b*, the petals. 3, One of the hoods (magnified) of the crown, with the little horn from within it. 4, A pair of pollen masses separated from the anther and magnified. 5, A flower with the stamens and crown removed, showing the 2 stigmas. 6, A mature pod (diminished in size). 7, A seed with its silky tuft.

ANALYSIS OF THE GENERA.

1 Stems erect or ascending, 1—5f high. Flowers in umbels....3
1 Stems twining and climbing. Flowers in racemes, cymes, &c....2
2 Leaves broad, heart-shaped at base, petiolate....5
2 Leaves not heart-shaped at base, ovate or linear....6
3 Corolla lobes reflexed or reflex-spreading....4
3 Corolla lobes erect. Lobes of the crown hornless. *S*......PODOSTÍGMA.
4 Hoods of the crown with a little horn from within each......ASCLÈPIAS. 1
4 Hoods of the crown concave, erect, and each destitute of a horn. ACERÀTES. 2
5 Smooth. Fls. whitish. Cor. lobes erect. Hoods each 2-awned. ENSLÈNIA.
5 Hairy. Fls. dark purple. Corolla flat, twisted in the bud..GONÓLOBUS.
6 Lvs. ovat., &c. Fls. brown-purp., 5 awned scales. Fil. distinct.† PERIPLÒCA.
6 Lvs. linear, long. Fls. greenish, crown 5-leaved. Fil. united. *S.* SEUTÈRA.

1. ASCLE'PIAS. SILK-GRASS. MILK-WEED.

Calyx and corolla deeply 5-parted, valvate in the bud, finally reflexed. Crown of 5 hooded lobes, each containing a little horn curved towards the stigmas. Filaments united into a tube covering the stigmas. Pollen masses waxy, pear-shaped, flattened, in pairs, contained within the 5-angled mass of anthers, pendulous. Pods (follicles) 2, seeds with a silky tuft of hairs.—♃ Leaves mostly opposite. Umbels between the petioles. *June—Aug.*

1 Leaves linear, long and narrow....7
1 Leaves broader, lanceolate, ovate, &c....2
2 Stems simple or very nearly so....3
2 Stems paniculately branched....8
3 Leaves petiolate, the petioles often very short....4
3 Leaves sessile and sometimes stem-clasping....9
4 Flowers more or less deeply purple....10
4 Flowers, or especially the crown, white....5
5 Leaves all opposite....6
5 Leaves in the middle of the stem 4-whorled. Flowers small....11
6 Leaves (especially the upper) tapering and acute at base....12
6 Leaves nearly all rounded or subcordate at base....13
7 Lvs. whorled, crowded, smooth. Umbels small, lateral..A. VERTICILLÀTA.
7 Lvs. scattered (the lower opposite, spatulate). Umb. term. *S.* A. MICHAÚXII.
7 Leaves all opposite. Umbels terminal. Horns included. *S*...A. CÍNERA.
7 Lvs. opposite. Umbels terminal. Crown yellow. *r. M. S.* A. PAUPÈRCULA.

8 Lvs. scattered. Flowers orange-yellow, hairy. Hight 1—2f. *c*..A. TUBERÒSA.
8 Lvs. opposite, petiolate. Fls. flesh-purple, smooth. Ht. 2—3f. *c*. A. INCARNÀTA.
9 Lvs. very obtuse, sessile. Umbel 1 only, terminal. *M. W.* A. OBTUSIFÒLIA.
9 Lvs. obtuse, clasping. Umbels several, lateral. *S*....A. AMPLEXICAÙLIS.
9 Lvs. acute, sessile. Umbels lateral. Pods soft-spiny. *W*..A. SULLIVÁNTII.
10 Corolla greenish-purple. Pods weak-spiny. *Very common*....A. CORNÙTI.
10 Cor. dark-purple. Pods smooth. Horns bent horizontal. *r*. A. PURPURÁSCENS.
10 Corolla red-purple. Pods smooth. Horns nearly erect. *r*. *M.S*..A. RÚBRA.
11 Leaves ovate, rounded at base. Umbels long-stalked...A. QUADRIFÒLIA.
11 Leaves lanceolate, acute at base. (A variety ?) *W*.....A. LANCEOLÀTA.
12 Leaves broad-ovate, large. Umbels large, terminal. *r*. A. PHYTOLACCOÌDES.
12 Leaves lanceolate, small. Umbels small, terminal. *M.W.S.* A. PARVIFLÒRA.
12 Leaves lanceolate. Umbels lateral. Stem downy. *S*..........A. NÍVEA.
13 Lvs. acute at base, smooth. Horns bent horizontal. *M.S*..A. VARIEGÀTA.
13 Lvs. subcordate at base, velvety. Horns hooked. *S*........A. OBOVÀTA.

2. ACERATES. HORNLESS MILKWEED.

Flowers like those of ASCLEPIAS, except that the hoods of the crown are destitute of the little horns which distinguish that genus. —Herbs ♃ with the leaves generally opposite and the greenish flowers in umbels. *May—July.*

1 Umbels sessile (not raised on stalks)....3
1 Umbels raised on longer or shorter stalks....2
2 Leaves ovate or oblong or elliptical....4
2 Lvs. linear, 3′—5′ long, scattered. Peduncles short. *W. S*....A. LONGIFÒLIA.
3 Leaves elliptic, varying to oblong and lanceolate. *c*......A. VIRIDIFLÒRA.
3 Leaves linear, rough, margin often revolute. *S*..........A. ANGUSTIFÒLIA.
4 Stem erect, smooth. Leaves petiolate, often scattered. *S*....A. PANICULÀTA.
4 Stem erect, a little downy. Leaves sessile, opposite. *S*......A. CONNÌVENS.
4 Stem decumbent, hairy, 4′—6′ long. Leaves scattered. *S*....A. LANUGINÒSA.

CHAPTER III.

OF THE APETALOUS EXOGENS.

Essential Character.—Flowering Plants (PHÆNOGAMIA), with their stems growing by additions to the outside and the wood in circular layers (EXOGENS), with the seeds enclosed in seed-vessels (ANGIOSPERMS), and the flowers destitute of petals (APETALÆ).

ORDER 110. POLYGONA'CEÆ.—BUCKWHEATS.

Herbs with alternate *leaves* and stipules in the form of sheaths above the swollen joints of the stem, *flowers* generally perfect, racemed, with *calyx* persistent, sepals united at base and imbricated in bud, with no *corolla* and a definite number (4—12) of stamens, with a 1-celled, 2- or 3-styled *ovary*, bearing in fruit a single seed.

ANALYSIS OF THE GENERA.

1 Sepals either 4 or 6, the outer reflexed, inner enclosing the fruit....2
1 Sepals 5 (rarely 4), about equal, all erect, enclosing the fr. POLÝGONUM. 1
2 Sepals 4. Stam. 6. Stigmas 2. Lvs. round-reniform, sour. *Mts. r.* OXÝRIA.
2 Sepals 6. Stam. 6. Styles 3. Coarse hbs. Fls. greenish. *Sorrel Dock.* RŬMEX.
2 Sepals 6. Stam. 9. Styles 3. Large, sour hbs. Fls. white. *Pie-plant.* RHĒUM.

1. POLY'GONUM. KNOT-WEED.

Calyx 5- (rarely 4-) parted, colored or corolla-like, the sepals all erect and enclosing the fruit. Stamens 4—9. Styles 2 or 3. Nut lens-shaped or 3-cornered.—Herbs with swollen joints. Pedicels usually jointed to the flower. *May—Aug.*

1 Leaves all cordate or arrow-shaped at base. Stamens 6—8....9
1 Leaves at base acute or rounded, very rarely a little cordate....2
2 Flowers all in the axils of the leaves, with 3 styles....8

3 Flowers with 5 stamens and 2 styles. Lvs. ovate or lance-ovate....17

3 Flowers with 6—9 stamens and 2 or 3 styles....4

4 Leaves linear or thread-shaped. Spikes slender. Styles 3....16

4 Leaves lanceolate, rarely ovate or spatulate....5

5 Styles 2 (or sometimes 3 when the plant tastes very acrid)....6

5 Styles 3, nut 3-cornered (plants scarcely at all acrid)....7

6 Plants smooth all over (or the stalks slightly rough)....13

6 Plants hairy or glandular-bristly, at least the stalks....12

7 Stem smooth (the stipules fringed). Spikes slender....14

7 Stem hairy. Spikes many, slender. Southern....15

8 Stem and branches upright or nearly so....11

8 Stem and branches prostrate, diffuse. Leaves small....10

9 Stem not twining, smooth or climbing with reversed prickles....18

9 Stem twining and climbing, but not prickly....19

10 Lvs. green, not fleshy. Nut wholly enclosed in the calyx. *c*..P. AVICULÀRE.

10 Leaves glaucous, fleshy. Nut longer than the cal., shining. *r*. P. GLAÙCUM.

11 Lvs. oval, large. Sta. 5. Branches few, 1—2f high. *c. M. W.* P. ERÈCTUM.

11 Lvs. lanceol. Stam. 8. Branches many, 3f high *r. W.* P. RAMOSÍSSIMUM.

11 Lvs. linear, sessile, sharp-pointed. Branches ½—1f high. *r*....P. TÉNUE.

12 Rather hairy, 6—8f high. Lvs. ovate. Spikes drooping, red.† P. ORIENTÀLE.

12 Glandular-bristly, 3—5f high. Lvs. lanceol. Spikes drooping..P. CÀREYI.

12 Sm'th below (2—3f high), stalks gland.-bristly, erect. P. PENNSYLVÁNICUM.

13 Lvs. lanceolate, with 1 dark spot. Styles half united. *c*...P. PERSICÀRIA.

13 Lvs. lance-ovate, all green. Styles separate, diverg. *r*..P. LAPATHIFÒLIUM.

13 Lvs. lanceolate, with transparent dots, intensely acrid. *c*..P. PUNCTÀTUM.

14 Spikes several. Lvs. lanceolate. Stipules fringed with long hairs. P. MÌTE.

14 Spike 1 only, sometimes bearing bulblets. Lvs. lanceo. *Mts. r.* P. VIVÍPARUM.

14 Spikes numerous, panicled. Lvs. spatulate. Plant shrubby. *S.* P. POLÝGAMA.

15 Hairy all over. Lvs. dotted. Stamens 7. Stalks 1-spiked. *S.* P. HIRSÙTUM.

15 Hairy except the stem. Stamens 8. Stalks long, 2-spiked. *S.* P. SETÀCEUM.

16 Lvs. glaucous, linear spatulate. Fls. rose-colored, nodding. *S.* P. GRÁCILE.

16 Lvs. green, linear, acute at each end. Fls. white, fringed. *S.* P. FIMBRIÀTUM.

16 Lvs. green, lin.-thread-form. Fls. greenish-white, nodding. P. ARTICULÀTUM.

17 Spikes thick, short. Seps. 5, equal. St. prost. at base. *Wet.* P. AMPHÍBIUM.

17 Spikes thin, slender, long. Seps. 4, unequal. St. erect. *W.* P. VIRGÍNICUM.

18 Smoothish, erect. Fls. white, panicled. Stam. 8. *Buckwheat.* P. FAGOPÝRUM.

18 Prickly backwards. Fls. racemed. Stamens 6. Lvs. hastate. *c.* P. ARIFÒLIUM.

18 Prickly backwards. Fls. capitate. Sta. 8. Lvs. sagittate. *c.* P. SAGITTÀTUM.

19 Roughish. Lvs. heart-hasta. Fls. racem. Joints smo'h. *c.* P. CONVÓLVULUS.

19 Downy. Lvs. cordate. Racemes panicled. Joints bristly. *r*..P. CILINÒDE.

19 Smooth. Lvs. cordate. Rac. leafy. Sepals winged in fruit. *c.* P. SCÁNDENS.

ORDER 111. PHYTOLACCACEÆ.—POKEWEEDS.

Herbs or *shrubs* with alternate leaves, no stipules, and flowers racemed, *sepals* colored, 4 or 5, *petals* none, *stamens* few or many, *ovary* of one or several carpels which are united into a ring forming a berry in fruit, *cells* as many as the carpels, each 1-seeded, *embryo* curved around the fleshy albumen.

ANALYSIS OF THE GENERA.

Sep. 5, roundish. Sta. 5—20. Ovary 5—12-carpeled and seeded. **PHYTOLACCA.** 1
Sepals 4, persistent. Sta. 4—12. Ovary 1-carpeled and 1-seeded. *S.* **RIVINA.**

1. PHYTOLACCA. POKE.

Character expressed in the Analysis.—Tall and stout perennials, with greenish flowers and purple berries.

P. DECANDRIA. Plant 5—8f high, very smooth, bushy. Lvs. large, ovate, acute at each end, petioled. Racemes at first terminal, finally opposite to the leaves. Berries round-depressed, of a rich dark purple. *July—Sept.*

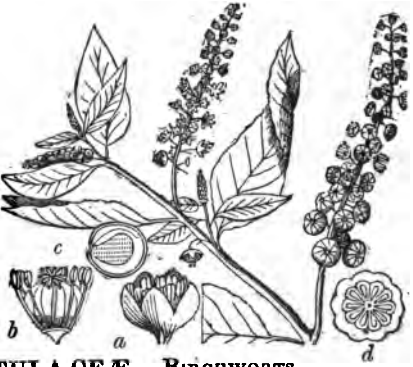


Fig. 248. Phytolacca decandria, leaves, flowers and fruit. *a*, A flower, natural size. *b*, Its stamens and ovary. *d*, Cross section of the ovary. *c*, A seed cut open, showing the embryo coiled around the albumen.

ORDER 125. BETULACEÆ.—BIRCHWORTS.

Trees or *shrubs* with deciduous stipules, with *leaves* alternate simple, having the veinlets running straight to the margin, with *flowers* monœcious, both kinds contained in scaly catkins, 2 or 3 under each bract, *calyx* and *corolla* hardly any, *ovary* 2-celled and 2-ovuled, but becoming in *fruit* a 1-celled and 1-seeded nut, by the suppression of the other seed and cell.

ANALYSIS OF THE GENERA.

♂ bracts with 12 stam. each; ♀ bracts with mostly 3 ovaries. *Birch.* BÉTULA. 1
♂ bracts with 4—8 sta. each; ♀ bracts with 2 ova. or fls. each. *Alder.* ALNUS

1. BETULA. Birch.

♂ in a cylindrical catkin, bracts each with 3 tetrandrous flowers beneath it. ♀ in an oblong or egg-shaped catkin, bracts 3-lobed, each with 3 2-styled ovaries or flowers, with no calyx. Samara flattened, broadly winged. — Trees and shrubs mostly with the outer bark in thin layers with horizontal fibres. Catkins appearing in early spring before the leaves.

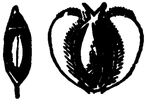


Fig. 250.

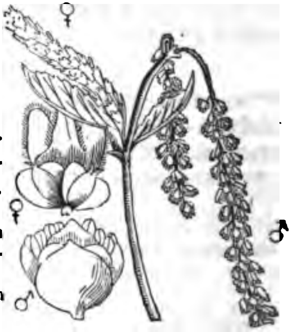


Fig. 249. Betula lenta (Sweet Black Birch), with staminate and pistillate catkins. ♂ a scale with staminate flowers. ♀ with pistillate flowers.

Fig. 250. *a*, A winged samara cut lengthwise, with its fertile and abortive cell. *b*, The same cut across.

1 Shrubs with brownish bark and roundish, crenate leaves....4
1 Trees with reddish-brown bark, and ovate, doubly-serrate leaves....3
1 Trees with white bark, long-stalked leaves and stalked catkins....2
1 Trees with yellowish bark and heart-ovate, serrate leaves.... B. EXCÉLSA.
2 Lvs. deltoid, taper-pointed, unequ. serra., smooth and shining. B. POPULIFÒLIA.
2 Lvs. ovate, often cordate, pointed, doubly-serrate, dull green. B. PAPYRÀCEA.
3 Lvs. rhombic-ovate, whitish-downy beneath, acute at each end. B. NÌGRA.
3 Lvs. heart-ovate, hairy on the veins beneath, acuminate.......B. LÉNTA.
4 Erect, 2—4f high. Lvs. round-obovate. ♀ catkins cylindrical..B. PÚMILA.
4 Trailing, 6′—20′. Lvs. round, small (½′ broad). ♀ catkins oblong. B. NÀNA.

CHAPTER IV.

OF THE AGLUMACEOUS ENDOGENS.

Essential Character.—Flowering plants (PHÆNOGAMIA), with their stems growing by additions made to the inner part and having no distinction of bark, pith and layers of wood (ENDOGENS); and with the flowers destitute of glumes (AGLUMACEÆ). The leaves are generally parallel-veined, and the flowers 3-parted.

ORDER 134. ARA′CEÆ.—AROIDS.

Chiefly *herbs* with a fleshy rootstock or corm, *leaves* sometimes net-veined, *flowers* mostly without calyx or corolla, arranged on a spadix, *stamens* few or many, hypogynous, very short, anthers turned outward, *ovary* free, stigmas sessile, fruit a dry or juicy berry, and the *seeds* with or without albumen.

ANALYSIS OF THE GENERA.

1 Spadix surrounded by a spathe....2
1 Spadix destitute of a spathe. Sepals 4—6....4
2 Flowers covering the whole spadix....3
2 Fls. covering only the base of the spadix. Berry 1-celled, 00-seeded. ARUM. 1
2 Fls. staminate at top of spadix, pistillate at base, mid. naked. *S.* CALÀDIUM.
3 Fls. monœcious, with no calyx. Spathe long, rolled, green..PELTÁNDRA.
3 Flowers perfect, with no calyx. Spathe open, reflexed, white....CÁLLA. 2
3 Fls. perfect, with a 4-parted cal. Spathe hooded, spotted. SYMPLOCÁRPUS.
4 Spadix on side of a leaf-like scape. Lvs. sword-shaped. *Sweet flag.* AC′ORUS.
4 Spadix on the top of a round thick scape. Flowers yellow.....ORÓNTIUM.

1. ARUM. INDIAN TURNIP. DRAGON-ROOT.

Flowers sometimes ♂ ♀. Spathe hooded, rolled at base. Calyx the middle, and pistillate at base. Berry 1-celled, many-seeded.—♃ herbs.

Lf. generally but 1, foot-shaped, with 7—9 lfts. Spathe green. A. DRACÓNTIUM.
Lvs. 2, each with 3 ovate lfts. Spathe mostly striped within.. A. TRIPHÝLLUM.
Leaves several, each with 5 lanceolate leaflets. *Southern*.........A. QUINÀTUM.
Lvs. several, simple, with 3 acute angles, arrow-shaped at base. *S.* A. WALTERI.

2. CALLA.

Flowers with no calyx. Spathe ovate, white inside, mostly reflexed. Spadix covered with flowers, which are either all perfect or the upper staminate. Berry many-seeded.—♃ Smooth and handsome herbs growing in water. *June*, &c.

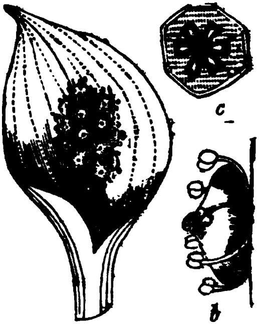


Fig. 251. Calla palustris, its spathe, spadix and flowers. *b*, One of the flowers, consisting of an ovary surrounded by six stamens. *c*, Cross section of the ovary.

Creeping, lvs. broad-cordate. Scape 4′—6′. Fls. mostly ☿. Native. C. PALUSTRIS.
Erect, tall, leaves arrow-cordate. Scape 3—5f. Upper fls.. ♂. †. C. ÆTHIÓPICA.

ORDER 138. ALISMA'CEÆ—ALISMADS.

Herbs growing in water, with the leaves parallel-veined, and with the *flowers* regular and not on a spadix, the perianth consisting of *sepals* and *petals*, 3 of each, the former always green, *stamens* few or many, *ovaries* several or many, distinct or coherent, each carpel 1-seeded, *fruit* dry, not opening, *seeds* with no albumen.

ANALYSIS OF THE GENERA.

1 Both the calyx and corolla greenish. Lvs. rush-like...2..(**Juncagineæ.**)
1 Corolla colored, white. Leaves mostly with a lamina....3
2 Anthers thick. Ova. 3—6, united. Lvs. radical, scape naked. TRIGLÒCHIN.
2 Anths. linear. Ovaries 3, nearly distinct. Lvs. sheathing...SCHEUCHZERIA

3 Fls. ☿. Stam. 6. Carp. numerous, whorled. c. *Water Plantain.* ALÍSMA. 1
3 Fls. ☿. Stam. 7—21. Carpels in a head. Lvs. narrow. r. ECHINÓDORUS.
3 Fls. ⚥. Sta. many. Lvs. generally arrow-shap. c. *Arrow-head.* SAGITTÀRIA. 2

1. ALISMA. WATER PLANTAIN.

Flowers perfect. Stamens 6. Ovaries and styles numerous, collected into a whorl, becoming in fruit many distinct, flattened achenia.—♃ Stemless herbs, the leaves all radical. Flowers in a panicle.

A. PLANTÀGO. A common, smooth, handsome inhabitant of ponds and ditches. Leaves oval or ovate, abruptly acuminate, 7—9-veined, entire; on long petioles. Scape 1—2f high, branching in whorls, bearing numerous purplish-white flowers, in July.

2. SAGITTA'RIA. ARROW-HEAD.

Flowers monœcious, rarely diœcious, the ♂ with about 24 stamens, the ♀ with numerous ovaries crowded in a head, and becoming in fruit as many compressed, margined achenia.—♃ Stemless plants, leaves radical, generally arrow-shaped. Flowers in whorls of 3s, the sterile ones above the fertile.

S. SAGITTIFÒLIA. A curious plant, conspicuous with its large white flowers among the rushes and sedges of sluggish waters. The petals are wholly white, and the scape simple, with the stalks 1-flowered. The leaves are generally arrow-shaped (as seen in the figure), but exceedingly variable, sometimes lanceolate, and sometimes even consisting of a petiole only. Generally about 1f high. *July.*

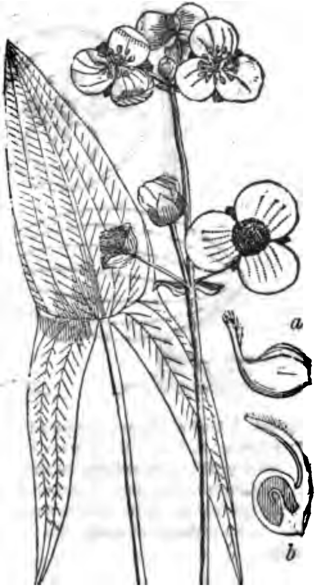


Fig. 252. Sagittaria sagittifolia (common form), leaf and flowers. *a*, One of the pistils enlarged. *b*, The pistil of Alisma cut open, showing the seed

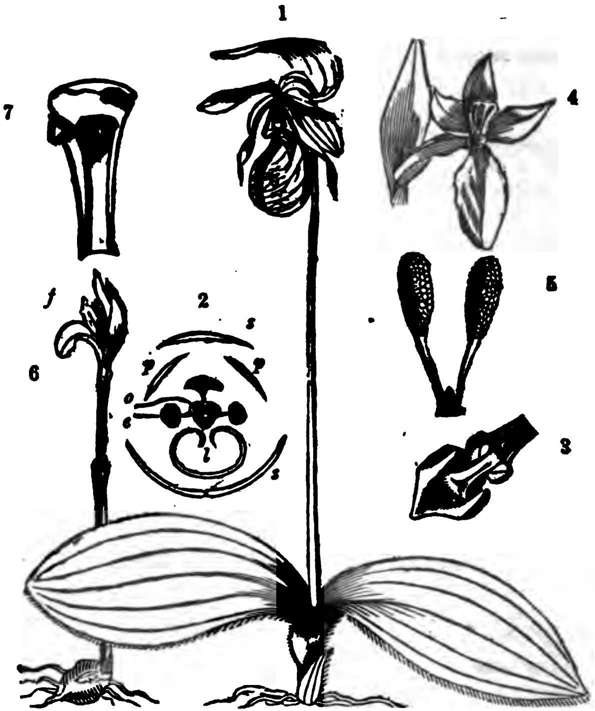


Fig. 253. 1, Ladies'-slipper, (Cypripedium acaule), whole plant, with its 2 leaves, scape and curious flower. 2, Plan of the flower; *s*, sepals (outer circle), the 2 lower united; *p*, the petals; *l*, lip (lower petal; *e*, the anthers, upper one sterile; *o*, the 3-celled ovary. 3, The column seen from beneath, with the pistil, two stamens and the leaf-like sterile one. 4, Flower and bract of Orchis spectabilis. 5, Its 2 pollen masses exhibited (enlarged). 6, Arethusa bulbosa; *f*, the flower. 7, Its column enlarged, with its lid-like anther open, showing the 4 pollen masses beneath.

ORDER 140. ORCHIDACEÆ—ORCHIDS.

Herbs perennial, with thick, fleshy roots, entire, parallel-veined leaves. *Flowers* very irregular, but the perianth consisting always of 6 parts, viz., of 3 *sepals* and 3 *petals*, all usually colored, the lower petal called the *lip* differing in form from the others, and frequently spurred at base, *stamens* 3, but only 1 or rarely 2 of them perfect, united with the style and forming what is called the *column*; *anthers* 2, 4 or 8-celled, *pollen* powdery, or waxy, or granulated; *ovary* 1-celled, many-seeded.

ANALYSIS OF THE GENERA.

1 Stems green, furnished with one or more leaves....2
1 Stems green, furnished with sheaths instead of leaves....8
1 Stems brownish, furnished with sheaths and no lvs. or a late one....7
2 Corolla lip very large, inflated and sack-like....13
2 Corolla lip of various forms but neither very large nor sack-like....3
3 Corolla produced into a spur behind....9
3 Corolla destitute of a spur....4
4 Flowers many, small, in a loose raceme....6
4 Flowers many, small, in a close spike....5
4 Flowers few or one only, showy, scarcely racemed....10
5 Flowers white, spirally arranged in the spike....11
5 Flowers yellow or purplish? *Southern*....12
6 Lip cordate or arrow-shaped. Fls. greenish. Leaf 1 only..MICRÓSTYLIS.
6 Lip broad and entire. Fls. greenish or purplish. Lvs. 2 only....LÍPARIS.
6 Lip flat, 2-lobed. Fls. greenish, &c. Lvs. 2, in middle of stem..LISTÈRA.
7 Root coraline. Spur growing to the ovary. Lvs. none...CORALLORHÌZA. 1
7 Root bulbous. Spur none. Leaf 1, late, green in winter...APLÉCTRUM.
8 Fls. 00, brownish-purpl. Lip beardless. (Sometimes a few lvs.) *S.* BLÈTIA.
8 Fl. one only, handsome, rose-purple. Lip bearded. *In bogs*....ARETHÙSA. 2
9 Flowers without bracts. Masses of pollen 4. Leaf 1 only...TIPULÀRIA.
9 Fls. in the axils of bracts. Pollen masses 2. Lvs. 1, 2 or many. ORCHIS. 3
10 Fl. one, rarely more, lip on the lower side, bearded. Lvs. 1—5. POGÒNIA. 4
10 Fls. several, lip on upper side, bearded. Lf. one, sword-shape. CALOPÒGON. 5

11 Lateral sepals ascending. Lip pointless. Lvs. wholly green. SPIRÁNTHES. 6
11 Lat. sepals erect. Lip strap-pointed. Lvs. with netted lines. GOODYÈRA.
12 Petals yel., spread. Grows on trees. Lvs. 2, thick, veiny. *S.* EPIDÈNDRUM.
12 Pet. purp.? converging. Grows in soil. Lvs. several, radical. *S.* CRÁNICHIS.
13 Lip sack-shaped, 3-lobed, bearded. Sta. 1. Root bulbous. *r.*..CALÝPSO.
13 Lip slipper-shaped, entire, beardless. Sta. 2. Rt. fibrous. *c.* CYPRIPÈDIUM. 7

1. CORALLORHI'ZA. CORAL-ROOT. DRAGON'S-CLAW.

Flower ringent. Sepals and petals similar, ascending, the upper arching. Lip produced behind into a short spur, which grows closely to the ovary. Pollen masses 4, oblique.—Herbs without green leaves, with a much-branched, thick root, a scaly stem with a raceme of dull-colored flowers. *May—Sept.*

1 Spur imperceptible. Lip not lobed, sometimes with 2 teeth at base....2
1 Spur manifest. Lip 3-lobed, side lbs. sm. Fls. purp. 10—20. *c.* C. MULTIFLÒRA.
2 Fls. purp., 9—18, lip round., crisp-edged. Ova. and pod glob. C. ODONTORHÌZA.
2 Fls. purp., 3—10, lip oblong, notched at end. Ova. & pod oblo. *S.* C. WISTARIÀNA.
2 Fls. yellow., 5—10, lip entire, oblong. Ovary and pod club-shaped. C. INNÀTA.

2. ARETHU'SA.

Sepals and petals cohering at base, similar, ascending, arching. Lip spurless, deflexed at the end, bearded inside, cohering to the petal-like column at base. Anther terminal, closing the 2 pollen cells like a lid. Pollen-masses 2 in each cell.—Small plants, 1-flowered, in wet places. Lvs. none, or hidden in the sheaths.

A. BULBÒSA. A beautiful plant 6′—12′ high, invested with about 3 long loose sheaths with lanceolate points (hardly leaves). At the top is a large, fragrant purple flower, in June. *See the figure.*

3. ORCHIS.

Flower ringent, sepals and petals similar, all or all but two ascending and arching over the column. Lip turned downward, entire or lobed, produced at base into a spur beneath, which is distinct from the ovary. Stamen 1, anther 2-celled, pollen-masses 2, consisting of numerous waxy grains.—Flowers generally showy, in spikes or racemes. *June—Aug., mostly.*

1 Leaves radical and only 2 (rarely 3). Flowers on a scape....4
1 Leaf radical and only 1. Flowers small, on a scape....5
1 Leaves on the stem, several, upper ones reduced to bracts....2
2 Corolla lip entire, neither lobed, fringed nor toothed....6
2 Corolla lip 2- or 3-toothed, not fringed nor divided. Fls. greenish....7
2 Corolla lip cleft into a fringe at the edge, but not divided....8
2 Corolla lip divided into 3 parts which are fringed or not....3
3 Flowers white or yellowish, the 2 side petals 2-parted. *Southern*....9
3 Flowers white, the 2 side petals entire or toothed; lip clawed....10
3 Flowers purple, numerous, showy; lip raised on a claw....11
4 Fls. few, pink-purp., handsome. Lvs. oblong-ovate. Ht. 4′—7′. O. SPECTÁBILIS.
4 Fls. whitish, race. Spur very long. Lvs. round. Scape bracted. O. ORBICULÀTA.
4 Fls. green., spiked. Spur long as ova. Lvs. round. Scape naked. O. HOOKÈRI.
5 Lf. obovate, obtuse. Lip linear, entire. Scape 5′—8′ high. *r*..O. OBTUSÀTA.
5 Lf. round. Lip 3-lobed, mid. lobe obcord. Hight 6′—9′. *r*. O. ROTUNDIFÒLIA.
6 Flowers greenish. Lip, petals, leaves and bracts lanceolate. O. HYPERBÒREA.
6 Fls. whitish. Lip lance-lin., rhombic at base. Bracts lance-linear. O. DILATÀTA.
6 Fls. white. Lip oblong-linear. Lvs. linear, bracts awl-shaped. *S.* O. NÍVEA.
6 Fls. yellow, close. Lip ovate, crenate. Lvs. lance-oblong. O. INTEGRIFÒLIA.
7 Lip 3-toothed at end. Spur longer than ovary. Bracts short. O. TRIDENTÀTA.
7 Lip 2—3-toothed at end, spur half as long. Bracts very long. O. BRACTEÀTA
7 Lip obtuse, with a tooth each side, spur twice as long..........O. FLÀVA.
8 Flowers yellow, small, lip slightly fringed, as long as the spur. O. CRISTÀTA.
8 Fls. yellow, large, lip deeply fringed, half as long as the spur...O. CILIÀRIS.
8 Fls. white, large, lip fringed; 2 side petals cut-toothed. O. BLEPHARIGLÓTTIS.
9 Lvs. oval. Spur twice long as ovary. 5 bristle-form lobes. O. QUINQUESÈTA.
9 Lvs. lanceol. Spur shorter than ovary. 5 of lobes bristle-form. O. RÈPENS.
10 Pets. toth'd. Lip lobes fan-shaped, much fringed. Fls. white. O. LEUCOPHÆ̀A.
10 Pets. entire. Lip lobes narrow, sparingly fringed. Fls. yellowish. O. LÁCERA.
11 Fls. dark-purp. Lip broad, lobes toothed, not fringed. *M. W. S. c.* O. FÍSSA.
11 Fls. light-purp. Lip wedge-shap., the 2 pets. merely toothed. *c.* O. PSYCÒDES.
11 Fls. light-purp. Lip semi-circl., large. 2 pets. fringed. *r.* O. GRANDIFLÒRA.

4. POGO′NIA. BEARD-FLOWER.

Flower with its sepals and petals distinct and somewhat spreading. Lip bearded inside, sometimes 3-lobed. Column club-shaped, wingless, anther terminal, pollen-masses 2, mealy.—Leaves 1—5, on the stem. Flowers purple. *June—Aug.*

1 Sepals linear, spreading, much longer than the petals....2
1 Sepals and petals nearly equal, similar, and nearly erect....3
2 Lvs. 5, in a whorl near the 1 brownish fl. Sepals 2′ long. *r.* P. VERTICILLÀTA.
2 Lvs. 2, alternate, distant, lance-obl. Lip 3-lobed, crenulate. *S.* P. DIVARICÀTA.
3 Lvs. 2, distant, upper bract-like. Fl. termin., pink-col'd. P. OPHIOGLOSSOÌDES.
3 Lvs. 3—4, alternate, with as many pink-white, drooping fls. *r.* P. PÉNDULA.

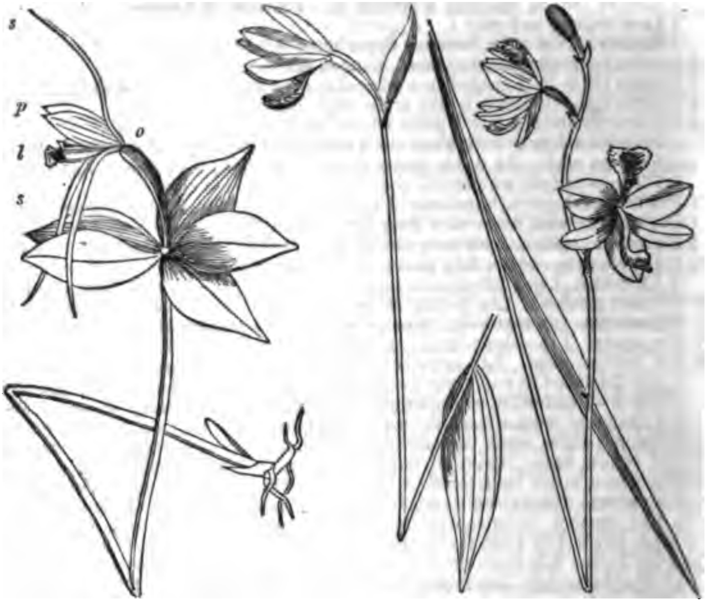


Fig. 254. Pogonia verticillata. **Fig. 255.** Pogonia ophiglossoides. **Fig. 256.** Calopogon pulchellus.

5. CALOPO'GON. Grass-Pink.

Flower with the sepals and petals similar, spreading, distinct. Lip on the upper side of the flower, stalked at base and bearded above. Column winged at the summit. Pollen-masses 2.—Leaf sheathing the base of the scape, which is bulbous at base. Flowers several.

CALOPOGON PULCHÉLLUS. A truly beautiful plant, common in moist meadows and in bogs. Scape slender, 1—2f high. Leaf sword-shaped or broad linear, long. Flowers pink-purple, remarkable for having the lip on the upper side and the column below. July.

6. SPIRANTHES. Ladies' Tresses.

Flowers in a spiral spike, somewhat ringent. Petals and sepals nearly erect, all tending to the upper side opposite the lip. Lip raised on a short claw, concave, entire, widened at top and furnished with 2 callous processes at base. Column arching, pollen-masses 2. —Stem leafy below or nearly naked, bearing a spike of small, white flowers, which are bent sideways and horizontal. *July—Oct.*

1 Fls. in a single row on one side, and but little twisted. Lvs. radical....2
1 Fls. in several rows all around the short spike. Lvs. on stem below....3
2 Lvs. ovate, varying to lance-oblong. Lip obovate, wavy-crisped. S. GRÁCILIS.
2 Lvs. lin., early withering (like first). Lip 3-lobed, finely crenate. S. TÓRTILIS.
3 Lvs. oblong-lance. 2′—4′ long. Spike dense. Lip oblo., blunt, crisp. S. LATIFÒLIA.
3 Lvs. lin.-lanceo., 3′–10′ long. Spike dense. Lip oblo., round, crisp. S. CÉRNUA.
3 Lvs. lance., pointed, 3′–15′. Spike loose. Lip ovate, crisp-fring'd. *S.* S. ODORÀTA.

7. CYPRIPE'DIUM. Ladies' Slipper.

The 2 lower sepals united into one piece or rarely distinct. Lip very large, inflated, sack- or slipper-form, obtuse. Column terminated by a petal-like lobe (which is the sterile stamen). Fertile stamens 2.—Root fibrous. Leaves large, plaited. Flowers large and showy, one or few. *May—July.*

1 Flowers yellow, one or more. Stems leafy....4
1 Flowers white or rose-purple....2
2 Stem leafy. Flower one or more....3
2 Scape naked, with 2 lvs. at the base, and 1 large flower at top. *c.* C. ACAÙLE.
3 Two lower sepals united. Fl. 1 only, smaller, white. *W.S. r.* C. CÁNDIDUM.
3 Two lower sepals united. Fls. few, very large, purplish. *c.* C. SPECTÁBILE.
3 Two lower sepals separate. Fl. 1 only, small, purplish. *r.* C. ARIETÌNUM.
4 Sepals narrow-lanceola. Lip flattened at sides, pale yellow. *c.* C. PUBÉSCENS.
4 Seps. ovate-lanceo. Lip flat above and below, bright yel. *c.* C. PARVIFLÒRUM.

Order 147. AMARYLLIDA'CEÆ.—Amaryllids.

Perennial *herbs* with parallel-veined *leaves*, showy yellow or white *flowers*, with the 6 *sepals* colored alike (not woolly), with 6 *stamens*, with the *ovary* inferior, 3-celled, *style* 1, and *stigma* 3-lobed, with the

ANALYSIS OF THE GENERA.

1 Scapes or stems arising from a coated bulb....2
1 Scapes arising from a solid bulb or from fibrous roots....6
2 Perianth 6-parted, containing also a colored crown within....5
2 Perianth 6-parted, not furnished with a crown, mostly white....3
3 Flower 1, regular, nodding. Sepals not united into a tube....4
3 Fls. regular, rather erect, funnel-form, tube long, slender. *S.*†...CRÌNUM.
3 Fls. irrègular, nodding. Stamens declined, unequal. *M.S.*†..AMARÝLLIS.
4 The 3 inner seps. smallest and notched at the end.† *Snow-drop.* GALÁNTHUS.
4 The 6 seps. similar, thickened at end. Fl. bell-shap.† *Snow-flake.* LEUCÒJUM.
5 Crown undivided, bell-form, enclosing sta. Lvs. ensiform.† NARCÍSSUS. 1
5 Crown (white) notched border bearing sta. Lvs. lin. &c. *S.*† PANCRÀTIUM.
6 Fls. tubular-funnel-form, many. Lvs. thick, radical. *False Aloe. S.*† AGÀVE.
6 Fls. star-shaped, spread., yel., few. Lvs. grass-like. *Star-grass. c.* HYPÓXIS.

1. NARCIS'SUS. JONQUIL. DAFFODIL.

Perianth regular, crown of one piece, funnel-form or bell-form, consisting of a whorl of sterile petal-like filaments united by their edges, within which the fertile stamens are inserted.—A beautiful genus of bulbous plants with sword-shaped leaves and yellow or white flowers. None here native.† *Apr.—June.*

1 Scape bearing 1—3 large flowers....2
1 Sc. many-fl'rd., sep. white, crown yellow, short. *Polyanthus.* N. TAZÉTTA.
2 Scape 2-edged. Seps. whitish. Crown yellow, long and large. N. DÁFFODIL.
2 Scape terete. Crown yellow, much shorter than the yel. seps. N. JONQUÍLLA.
2 Sc. terete. Crown variegated, rotate, short; sep. mostly white. N. POÉTICUS.

ORDER 149. IRIDA'CEÆ.—IRIDS.

Perennial *herbs*, arising from bulbs or thickened roots, *leaves* 2-rowed, *flowers* perfect, regular or irregular, spathaceous, *perianth* of 6 petal-like segments, stamens 3, anthers turned outwards, *ovary* inferior, 3-celled, with 1 style and 3 stigmas, becoming in *fruit* a 3-celled capsule with many albuminous seeds.

ANALYSIS OF THE GENERA.

1 **Flowers regular, 3 petals unequal to the 3 sepals....2**
1 **Flowers regular, petals and sepals alike....3**
1 **Fls. irregular, stamens ascending. Sds. winged.** ***Corn Flag.*† GLADÌOLUS.**
2 Stamens separate. Stigmas petal-like. Petals erect. Sep. reflexed. IRIS. 1
2 Stamens united. Seps. very large. Pets. spreading.† *Tiger Flower*. TIGRÌDEA.
3 **Fls. blue, small, rotate. Lvs. &c. grass-like.** ***Blue-eyed-grass.*** **SYSIRÝNCHIUM.**
3 **Fls. purp., white or yellow, tube very long, sessile on the bulb.† CRÒCUS.**
3 **Fls. yellow, red-spotted, tube short. Hight 3—5f.†** ***Ixia*...PARDÁNTHUS.**

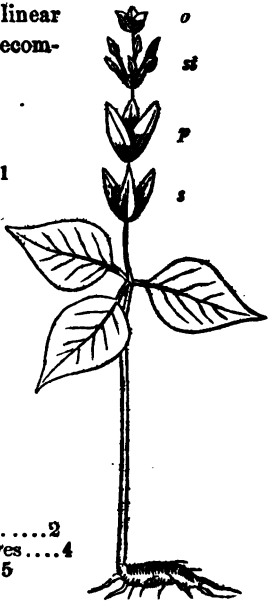
1. IRIS. FLOWER-DE-LUCE.

Perianth 6-parted, the 3 outer divisions (sepals) reflexed, or spreading, the 3 inner (petals) erect. Stamens 3, distinct. Style short. Stigmas 3, petal-like, covering the stamens.—Perennial herbs with thick roots or root-stocks, sword-shaped or grass-like leaves and large showy flowers. ***Apr.—July.***

1 Stems leafy, tall (1—2f high), mostly bearing several flowers....2
1 Scapes leafless, low (1′—6′ high), mostly bearing but 1 flower....4
2 Sepals or perianth bearded. Cultivated exotics in gardens, &c....9
2 Sepals and petals beardless. Wild plants, hardly ever cultivated....3
3 Leaves linear, grass-like, less than half an inch wide....5
3 Leaves sword-shaped, nearly 1′ or 2′ wide....6
4 Sepals or perianth bearded, beard crested or not crested....8
4 Sepals and petals beardless, but sometimes with a crest....7
5 Stem hollow. Ova. & pod obtuse, sides flat. Fls. light blue. *S.* I. SIBÍRICA.
5 St. slend. Ova. and pod acute, sides 2-groov. Fls. yel.-blue. *E.* I. PRISMÁTICA.
6 St. 1-angled. Fls. blue-yell.-whit. Pet. obtu., large. *c.* ***Blue Flag.*** I. VERSÍCOLOR.
6 St. terete. Fls. blue. Petals very small, 3-toothed at the end. *S.* I. TRIPÉTALA.
6 Stem terete. Fls. orange-yell. Sepals and pet. notched at end. *S.*.I. CÙPREA.
7 Scape 1-flowered, fl. blue and yellow. Lvs. lanceolate. *r. W.* I. LACÚSTRIS.
7 Scape 1-flowered, fl. blue. Lvs. linear, very long. Pod round. *S.*.I. VÉRNA.
7 Sc. 3-flowered, fls. yell. Lvs. sword-shaped. Pod 6-angled.† I. OCHROLEÙCA.
8 Sc. 1-fl'rd, 2′—4′ high, fl. blue and yellow. Lvs. lance. 3′ long. *S.* I. CRISTÀTA.
8 Sc. 1-fl'rd, 6′—10′ high, fl. deep blue. Pet. obtuse. Lvs. ensiform.† I. PÚMILA.
8 Scape many-fl'rd, flattened. Fls. pale blue. Stigmas jagged.†..I. CHINÉNSIS.
9 Stem many-fl'rd, fls. blue or whitish. Pet. and sep. notched.†*c.* I. SAMBUCÌNA.
9 Stem many-flow'rd, fls. deep blue, spathes also colored.† *r.*.I. GERMÁNICA.
9 Stem 1-fl'rd, fl. striped. Petals deflexed. *Chalcedonian Iris.*†...I. SUSIÀNA.

ORDER 152. TRILLIA'CEÆ—TRILLIADS.

Herbs with tuberous roots, simple stems, and whorled, net-veined *leaves*, with the *flowers* one or few, terminal and mostly 3-parted, with the *sepals* green, and the *petals* more or less colored, with the *stamens* 6—10, awl-shaped filaments and linear anthers, with the *ovary* free, 3—5-celled, becoming in fruit a juicy, many-seeded pod.



ANALYSIS OF THE GENERA.

Plants with 1 whorl of leaves and
1 flower. Pod many-seeded... .TRÍLLIUM. 1
Plant with 2 whorls of leaves and
several greenish fls... MEDĖOLA *Virginica*.

Fig. 257. Trillium erythrocarpum, with the parts of its flower separated. *s*, the 3 sepals; *p*, the 3 petals; *st*. the 6 stamens; *o*, the 3 carpels.

1. TRIL'LIUM. WAKE ROBIN.

Character as expressed in the Order above.—♃ Low herbs with a simple stem, bearing at top a whorl of 3 leaves and a single large flower. *April—June.*

1 Flower sessile, petals dark purple....3
1 Fl. on a peduncle, raised above the leaves......2
1 Fl. on a peduncle recurved beneath the leaves....4
2 Lvs. sessile, rhomboidal or rhomboid-ovate...5
2 Leaves petiolate, rounded at the base....6
3 Lvs. sessile. Seps. erect, ½ as long as linear lanceolate petals. T. SÉSSILE.
3 Lvs. petiolate. Seps. recurved, long as lance-ovate petals. T. RECURVÀTUM.
4 Lvs. round-rhomboidal, pointed. Pets. white, pointed, recurv.. T. CÉRNUUM.
4 Lvs. lance-elliptic, acute. Pets. rose-white, obtuse, straight. *S.* T. STYLÒSUM.
5 Petals ovate, dark purple (or white), ill-scented, flat. *c*.......T. ERÉCTUM.
5 Pets. obova., rose-white, recurv., twice larger than seps. T. GRANDIFLÒRUM.
5 Petals obovate, rose-white, obtuse, flat, as large as sepals...T. OBOVÀTUM.
6 Stem 2′—4′ high. Lvs. obtuse. Petals obtuse, wavy, snow-white. T. NIVÀLE.
6 Stem 8′—12′. Lvs. & pets. pointed, wavy, purp.-white. T. ERYTHROCÁRPUM.

ORDER 153. LILIA'CEÆ.—LILYWORTS.

Herbs with parallel-veined leaves, bulbous or tuberous stems, *flowers* perfect, regular, generally large and richly colored, *perianth* 6 (rarely 4)-parted, uniformly colored, free from the ovary, *stamens* 6 (rarely 4), anthers fixed by a point and turned inwards, *style* single, ovary superior, 2- or 3-celled, *seed* with fleshy albumen.

ANALYSIS OF THE GENERA.

1 Plants arising from a coated or scaly bulb....2
1 Plants arising from a root-stock or fibrous roots....5
2 Scapes bearing the flowers and sheathed at base by the leaves....3
2 Stem bearing above the base both leaves and flowers....8
3 Sepals and petals united below into a tube....11
3 Sepals and petals separate, not forming a tube....4
4 Flower 1 only, the perianth bell-shaped....7
4 Flowers few or many, star-shaped, umbeled or corymbed....9
4 Flowers many, star-shaped, racemed or panicled....10
5 Sepals united into a tube to near the top. Flowers small....14
5 Sepals united into a tube less than half-way up. Flowers large....15
5 Sepals and petals separate, or not united into a tube....6
6 Stems (leafy) dividing into leafy branches....12
6 Stems or scapes not branched, or with leafless branches....13
7 Flower nodding. Leaves 2, usually spotted with brown..ERYTHRÓNIUM. 1
7 Flower erect. Leaves 1 or more, thick, glaucous. *Tulip.*†....TÙLIPA.
8 Sepals each with a grooved line lengthwise within. *Lily*........LÍLIUM. 2
8 Sep. each with a honey cavity at base within. *Crown-imperial.* FRITILLÀRIA.
9 Flowers in a close umbel with a 2-leaved spathe. *Garlick, &c.*..ALLIUM. 3
9 Flowers in a loose corymb, white.† *Star-of-Bethlehem.*..ORNITHÓGALUM.
9 Fls. 2 or 3, large, white, woolly within, smooth at base. *S.* CALOCHÓRTUS.
10 Style thread-like. Ovary cells several-seeded. Fls. blue. *W. S.*...SCILLA.
10 Style very short. Ovary cells 1-seeded. Fls. white. Ht. 2—3f. *S.* NOLÌNA.
11 Fls. white, large, fragrant. Sta. on top of tube. *Tuberose.*† POLIÁNTHES.
11 Fls. blue, smallish. Stamens on middle of tube. *Hyacinth.* HYACINTHUS.

12 Lvs. thread-form, short, fascicled. Berries red. Ht. 3—4f.†.. ASPÁRAGUS.
12 Lvs. ovate, &c. Seps. rose-white, recurv. at end. *Twist-foot*. *c*. STRÉPTOPUS.
12 Leaves ovate, &c. Sepals straw-color, straight or twisted. *c*.. UVULÀRIA. 4
13 Fls. white or yell. Lvs. lance-oval, &c. Ber. glob. *Solm's-seal*. SMILACÌNA. 5
13 Fls. green-whit., many. Lvs. thick, ensiform, &c. Pod 3-cornered. *S*. YUCCA.
13 Fls. yellow, star-shaped. Lvs. narrow. Fr. a pod. *Asphodel*. ASPHÓDELUS.
14 Fls. greenish, axilla. St. leafy, recurved. *c*. *Solomòn's-seal*. POLYGONÀTUM.
14 Fls. white, racem. on scape. Lvs. radical. *Lily-of-the-valley*. CONVALLÀRIA. 6
15 Fls. tawny or yel. Lvs. long, lance-lin. *Yellow Day Lily*.† HEMEROCÁLLIS.
15 Fls. blue or whit. Lvs. cordate or ova.† *Blue & White Day Lily*. FÚNKIA.

1. ERYTHRO'NIUM. DOG-TOOTH VIOLET.

Perianth bell-form, sepals recurved, the 3 inner ones usually with a callous tooth each side near the base, and a groove in the middle. Pod a little stalked. Seeds egg-shaped.—Stem a bulb deep in the ground. Scape bearing a single flower, its base sheathed by the base of the two smooth leaves. *Apr.—May*.

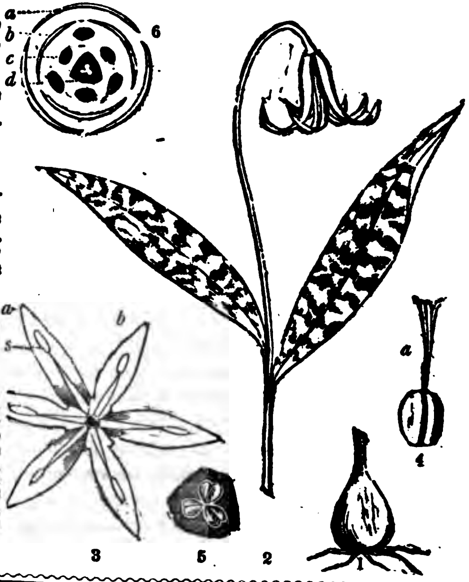


Fig. 258. The Dog-tooth Violet. (E. Americanum.) 1, the bulb. 3, The flower spread open, showing the 2 teeth in each petal, also the position of all the parts. 4, The ovary, style and stigma. 5. A cross-section of the ovary. 6, The plan of the flower. *a*, the 3 sepals in the outer circle; *b*, the 3 petals next; *c*. the 6 stamens and *d*, the 3-celled ovary.

Flower yellow. Scape without a bract. Petals toothed. *c*... E. AMERICÀNUM.
Fl. greenish-yel. Scape bearing a bract. Lvs. very unequal. *r*. E. BRACTEÀTUM.
Flower white. Scape without a bract. Petals not toothed. *W. r*.. E. ALBÌDUM.

2. LIL'IUM. Lily.

Perianth bell-shaped, segments mostly recurved, each with a groove running lengthwise within from the middle to the base. Stamens shorter than the style. Valves of the pod connected by latticed hairs.—Herbs with bulbous and leafy stems. Leaves whorled or scattered, sessile. Flowers terminal. *June—July.*

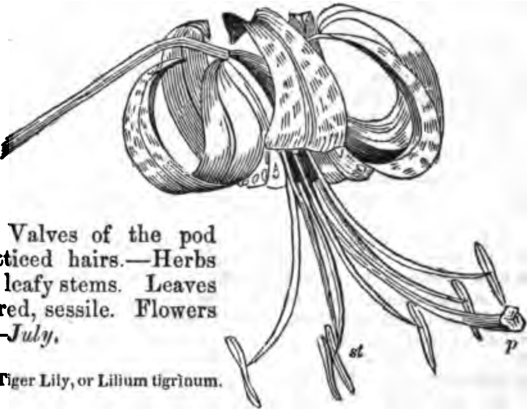


Fig. 259. A flower of the Tiger Lily, or Lilium tigrinum.

1 Plants bearing bulblets in the axils. Flowers orange. Gardens....6
1 Plants not bulbiferous in the axils of the leaves....2
2 Flowers erect, orange-red. Sepals raised on claws....5
2 Flowers nodding, white. Sepals sessile. Gardens....7
2 Flowers nodding, yellow or orange. Sepals sessile. Wild plants....3
3 Sepals orange-red, strongly revolute, almost into rings....4
3 Seps. yellow, merely recurved, spreading above middle. *c*. L. CANADÉNSE.
4 Fls. 3—30, very showy. Lvs. lanceol., lower whorled. *c.M. W.S.* L. SUPÉRBUM.
4 Fl. generally but 1. Lvs. wedge-lanceolate, partly whorled. *S*. L. CAROLÌNUM.
5 Upper lvs. in whorls. Flowers 1—3, purple-spotted. *c*. L. PHILADÉLPHICUM.
5 Leaves all scattered. Flower 1, red- and yellow-spotted. *S*. L. CATESBÆ'I.
6 Fls. erect, rough within, bell-shap. Lvs. 3-veined, scattered.† L. BULBÍFERUM.
6 Fls. nodding. Seps. strongly revolute. Lvs. 3-veined, scattered.† L. TIGRÍNUM.
7 Fls. in a raceme, smooth, large. Lvs. scattered.† *White Lily*. L. CÁNDIDUM.
7 Fl. 1 only, very large. Sepals reflexed at end.† *Japan Lily*. L. JAPÓNICUM.

3. AL'LIUM. Garlick, Onion, &c.

Flowers in a dense umbel with a 2-leaved spathe. Perianth deeply 6-parted, colored, usually spreading, persistent. Stamens 6.

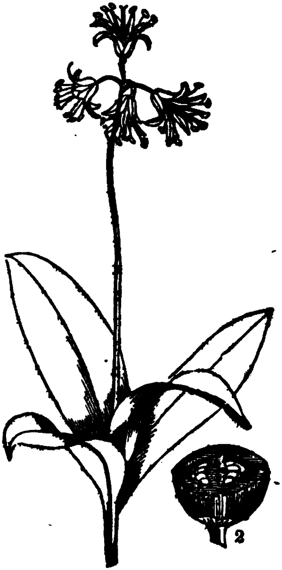
Ovary angular. Style thread-like. Pod 3-lobed, containing 1 or 2 black seeds in each cell.—Strong-scented, bulbous, stemless herbs, the leaves radical and the umbel on a scape, sometimes bearing bulblets instead of flowers. *May—July.*

1 Plants growing only by cultivation in gardens, &c....4
1 Plants growing wild, in woods, meadows, &c....2
2 Scapes bearing bulbs in the umbel with the rose-colored flowers....5
2 Scapes bearing only flowers in the umbel....3
3 Leaves lance-oblong, sometimes perishing before flowering....6
3 Leaves linear, flat or very nearly flat. Flowers rose-colored....7
3 Leaves linear, channeled above and angled beneath....8
4 Filaments 3-cleft. Leaves flat, linear, sheathing at base....9
4 Filaments all simple. Leaves terete and tubular, large or slender....10
5 Filaments broad, 3 inner ones 3-cleft. Leaves terete, tubular..A. VINEÀLE.
5 Filaments all simple. Lvs. linear, flattish. Scape terete. A. CANADÉNSIS.
6 Lvs. perish before flowering. Umb. erect, with many white fls. A. TRICÓCCUM.
6 Lvs. accompanying the few flowers, longer than the scapes. *r.* A. TRIFLÒRUM.
7 Umbel loose-fl'red, nodding. Scape angular. Lvs. very long. A. CERNUUM.
7 Umbel many-flowered, erect. Scape terete. Pod 3-seeded. *S.* A. MUTÁBILE.
8 Leaf 1 only. Flowers numerous, in a level-topped umbel. *S.* A. STELLÀTUM.
8 Leaves many, streaked on the back. Scape 3-angled. *S.*.....A. STRIÀTUM.
8 Leaves many. Umbel level-topped. Scape 2-edged. *S.*.....A. ANGULÒSUM.
9 Scape leafy below. Lvs. flat. Umbel bulb-bearing.‡ *Garlic.* A. SATÌVUM.
9 Scape leafy below. Lvs. flat. Umbel with flowers only.‡ *Leek.* A. PÓRRUM.
10 Leaves rush-like, slender, as long as the scapes.‡ *Chives.* A. SCHŒNOPRÀSUM.
10 Lvs. large, thick. Scape tall, hollow, swollen below.‡ *Onion.* A. CÈPIUM.

4. UVULA'RIA. BELLWORT.

Perianth 6-parted. Sepals linear-spatulate or lanceolate, with a honey cavity at the base of each. Filaments very short, anthers half as long as the sepals. Style 3-cleft. Pod (or berry) 3-celled, cells few-seeded.—Root-stock creeping. Stem leafy and usually branched. Flowers mostly solitary, straw-yellow, pendulous. *May.*

1 Leaves perfoliate (§ 220). Pod obovate, 3-lobed at end....3
1 Leaves sessile. Sepals cream-colored, obtusish, ovate, 3-angled....2
1 Lvs. sessile. Sepals greenish, acuminate. Berry red. *M.S.* U. LANUGINÒSA.
2 Lvs. glabrous, glauc. beneath. Pod raised on a little stalk. *c.* U. SESSILIFÒLIA.
2 Lvs. fine-downy, shining green both sides. Pod sessile. *Mts.S.* U. PUBÉRULA.
3 Seps. smooth within and without, 1½′ long. Anths. obtuse. U. GRANDIFLÒRA.
3 Seps. granular-rough. within, scarce 1′ long. Anth. pointed. U. PERFOLIÀTA.



5. SMILACI'NA.

Solomon's-Seal. (Convallaria.)

Perianth 4- or 6-parted. Sepals spreading more or less. Stamens 4 or 6, divergent, arising from the base of the sepals. Berry globular or ovoid, 2- or 3-celled, few- or many-seeded.—Plants somewhat various in habit, with simple stems, alternate or radical leaves, and racemes or umbels of flowers. ***May—June.***

Fig. 260. Smilacìna boreàlis. 2, A berry cut open, showing the 2-cells, &c.

1 Stem leafy. Flowers star-shaped, white, racemed. Berries speckled....2
1 Scape leafless. Flowers bell-shaped, in umbels. Berries blue....4
2 Perianth 6-parted. Stamens 6. Leaves never cordate....3
2 Perianth 4-parted. Stamens 4. Lvs mostly 2, cordate. Dwarf. *c*..S. BIFÒLIA.
3 Lvs. mostly 3, tapering at both ends. Raceme simple. Low. *r*. S. TRIFÒLIA.
3 Lvs. 8—10, lanceolate, clasping, 3-veined. Raceme simple..S. STELLÀTA.
3 Lvs. many, lance-oval, short-stalked. Raceme compound. *c*. S. RACEMÒSA.
4 Umbel 3—7-flowered. Fls. yellowish. Berry many-seeded. *c*. S. BOREÀLIS.
4 Umbel 12—30-flowered. Fls. whitish, spotted. Ber. 4-seed. *r*. S. UMBELLULÀTA.

ORDER 155. MELANTHA'CEÆ.—MELANTHS.

Perennial *herbs*, sometimes bulbous, often poisonous, with the *leaves* parallel-veined, *perianth* regular, double, 6 parted, *sepals* all of one color, with 6 stamens and 3 distinct styles,

ovary **free from the calyx, becoming in fruit a 3-celled pod, *seeds* few or many, with a membranous coat and fleshy albumen.**

ANALYSIS OF THE GENERA.

1 Stem (leafy) bearing a panicle of racemes....2
1 Stem or scape bearing a simple raceme or spike....3
2 Flowers ♂☿♀ on the same plant. Lvs. oval, or lanceolate, or linear....4
2 Flowers all perfect (☿). Leaves linear and grass-like....5
3 Leaves linear or rush-like, both radical and cauline....6
3 Leaves lanceolate or oval. Pod many-seeded....7
3 Leaves linear and grass-like, all of them radical....8
4 Sepals destitute of glands and free from the stamens..........VERÀTRUM. 1
4 Sepals bearing each 2 glands and a stamen on its claw.....MELÁNTHIUM.
5 Flowers greenish-white. Sepals each with 2 glands at base. ZIGADÈNUS.
5 Fls. pure white, showy. Sepals destitute of glands. *M.S.* }
6 Lvs. grass-like, few on stem. Fls. numer., whit. *Fly-poison.* } AMIÁNTHIUM.
6 Lvs. rush-like, numerous, dry. Flowers white, showy. *M.S.* XEROPHÝLLUM.
6 Lvs. sedge-like, very narrow, dry. Flowers greenish, dry. *S*......PLEÈA.
7 Flowers perfect (☿), greenish-white. Lvs. all radical. *M.S.*..HELÒNIAS.
7 Fls. diœcious (♂♀), yellow.-white. St. leafy. (*Helonias.*) CHAMÆLÍRIUM.
8 Fls. minute, green. Spike very slender. Anths. 1-celled. *S.* SCHŒNOCAÙLON.
8 Fls. small, colored, spiked or racemed. Anthers 2-celled. *W.*..TOFIÉLDIA.

1. VERA'TRUM. POKE. FALSE HELLEBORE.

Flowers polygamous by abortion in the same plant. Sepals united at base, colored, spreading, sessile and without glands. Stamens 6, shorter than the sepals, wanting in some of the flowers. Ovaries 3, united at base, often abortive. Pod 3-partible, many-seeded.—Stems leafy more or less. Flowers panicled. *June—July.*

1 Leaves oval or lanceolate. Sepals obovate-oblong....2
1 Leaves linear, grass-like. Sepals lance-linear, pointed. V. ANGUSTIFÒLIUM.
2 Leaves oval, large. Stem very leafy, thick. Fls. greenish. *c*....V. VÍRIDE.
2 Lvs. lanceolate, &c. Stem few-leaved, tall. Fls. black-purp. *W.* V. WOÓDII.

INDEX AND GLOSSARY:

CONTAINING DEFINITIONS OF BOTANICAL TERMS, TOGETHER WITH REFERENCES TO THOSE PARAGRAPHS IN WHICH THEY ARE DEFINED IN THE FOREGOING LESSONS.

A (in composition) signifies without; as, apetalous, destitute of petals.
Abortive, imperfect, useless.
Abbreviations, page 12.
Acaulescent, 81.
A'cerose, needle-shaped, 179.
Achénium, 378.
Acícular, needle, or bristle-shaped.
Acrogens, 423.
Aculeate, armed with prickles.
Acuminate, pointed, 194.
Acute, sharp-angled, 192.
Adherent, 273.
A'dnate, growing to or upon, 225.
Æstivation, 345.
Aggregate, assembled close together.
Aglumaceæ, 422.
Alæ, wings. *Alate*, winged.
Alburnum, 125.
Albùmen, *Albuminous*, 392.
Alternate, 74, 141.
A'lveolate, honey-comb-like; as the receptacle of some Asterworts.
Ament, 247. *Amentaceous*, 247.
Amplexicaul, stem-clasping, 152, 219.
Analysis, 443.
Ancipital, two-edged.
A'ngiosperms, 420.
Angiospermous, seeds in a vessel, 420.
Annual, yearly, 48, 57.
Anther, 301.
Apetalæ, 421.
Apetalous, without petals.
Appendage, some unusual part added.
Appressed, pressed closely upon something else.
Aquatic, growing in water.
Arborescent, tree-like.
Arid, dry.
Aristate, bearded, as the glumes of barley.
Armed, 109.
Aromatic, strong-scented, spicy.
Articulation, a joint; the place where one thing is joined to another.
Artificial Classes, 304, 410.
Artificial Orders, 323.
Ascending, arising obliquely, assurgent.
Assurgent, arising in an oblique direction.
Attenuate, made slender, or thin.
Auriculate, or *Auricled*, 191, 10.
Awn, 230, 231.
Axil, arm-pit, 68.
A'xillary, growing out of the axils, 67.
Axis, the stem, or centre of a thing, around which the parts are arranged, 78.
Baccate, berry-like, covered with pulp.
Banner, 292.
Bark, 128.
Beak, a hard, short point, like that of a bird.
Bearded, with long, stiff bristles, or hairs.

Bell-shaped, 281.

Berry, 384.

Bi (in composition), twice; as in

Bicuspidate, with two points.

Bidentate, with two teeth.

Biennial, of two years' duration.

Bifid, two-cleft.

Bifoliate, two-leaved.

Bifurcate, two-forked.

Bilabiate, two-lipped.

Binate, two growing together.

Bipinnate, twice-pinnate, 213.

Bipinnatifid, twice-pinnate-cleft.

Bisaccate, with two tumors, or sacks.

Biternate, twice ternate, 216.

Bìvalved, two-valved.

Botany defined, 4.

Bracteate, or *Bracted*, having bracts.

Brácteoles, or *Bractlets*, little bracts.

Bracts, 227.

Branch, 70.

Branchlets, small branches.

Bristles, stiff hairs.

Bud, 64.

Bulb, 83. *Bulbous*, having bulbs.

Bulblets, little bulbs borne above the ground, 85.

Caducous, falling off very early.

Cálycine, of the calyx.

Calyculate, having bractlets resembling an outer additional calyx.

Calyx, 271.

Campanulate, bell-shaped, 281.

Canescent, whitish with fine hairs.

Capillary, very slender, hair-like.

Capitate, head-shaped, globular.

Capsule, a pod, 367.

Carinate, keel-shaped.

Caryopsis, a grain, or kernel, 377.

Carpels, 317.

Cartiláginous, gristly.

Caryophyllàceous, 291.

Catkin, ament, 247.

Caudate, with a tail.

Caudex, 33.

Caulescent, 93.

Cauline, 146.

Caulis, 93.

Cellular, composed of cells.

Cellular tissue, 119.

Cernuous, nodding.

Chaffy, with chaff.

Character, marks which distinguish a species, genus, &c.

Chartaceous, of the texture of writing paper.

Ciliæ, hairs like those of the eyelashes.

Ciliate, 18.

Circinate, 354.

Circumscissile, opening like a lid.

Cirrhose, 210.

Clavate, club-shaped.

Claw, *Clawed*, 278.

Climbers, 99, 102.

Còchleate, resembling the shell of a snail.

Cohering, connected.

Collective fruit, 385.

Colored, not green.

Column, the consolidated stamens and pistils of the Orchids.

Coma, a tuft of hairs.

Compound flowers, 253.

Compound leaves, 154, 206.

Compressed, flattened lengthwise.

Cone, the same as strobile, 386.

Cónfluent, joining together.

Conjugate, joined in pairs.

Connate, joined together at the base.

Connivent, converging together.

Contorted, twisted, 349.

Convex, rising spherically.

Cónvolute, 348.

Cordate, heart-shaped, 171, 178.

Coreaceous, leathery, thick and tough.

Corm, 86.

Cornute, *Corniculate*, horned.

Corolla, 276.
Coròna, or *Crown*, the expanded, cup-like disk of Narcissus, &c.
Corymb, 249.
Corymbose, arranged like a corymb.
Costate, ribbed.
Cotyledon, 394.
Creeper, 90.
Crenate, and *Crenulate*, 184.
Crisped, 190.
Cristate, or *Crested*, with a raised ridge.
Cruciform, 288.
Cryptogámia, 22, 398, 417.
Cùcullate, hood-shaped, cowled.
Culm, 95.
Cùneate, wedge-shaped.
Cupule, the cup of the acorn, &c.
Cuspidate, with a small, abrupt point.
Cuticle, the epidermis, scarf-skin.
Cyme, 258. *Cymose*, like a cyme.
Decandrous, with 10 stamens.
Deciduous, 232.
Declinate, turned aside, or downward.
Decompound, more than once compounded; as, bipinnate, &c.
Decumbent, lying upon the ground, but rising toward the apex.
Decurrent, 221.
Decussata, crossing at right angles.
Deflexed, bent downward.
Dehiscence, 369.
Deltate, or *Deltoid*, 169, 4.
Dentate, and *Denticulate*, 182.
Depressed, flattened from above.
Di (in composition), two; as in
Diadelphous, stamens united in two sets.
Diándrous, with two stamens.
Dichotomous, branched by two equal divisions; forked.
Didy'namous, having 2 long stamens and 2 short ones, in the flower.
Diffuse, spreading widely, or loosely.
Digitate, 173.
Diœcious, bearing staminate flowers on one plant, and pistillate on another, 312, 22.
Discoid, 255.
Disk, 253, 297.
Dissected, cut into 2 parts.
Dissepiment, the partitions in a pod, &c., separating the cells.
Distinct, not united with each other.
Divaricate, spreading in a straggling manner.
Dodecándrous, with 12 stamens.
Dorsal, on the back.
Downy, clothed with soft hairs.
Drupe, 373.
Durámen, 126.
E, or *Ex* (in composition), destitute of.
Echinate, beset with prickles.
Elliptical, 168: 2.
Elongated, exceeding the common length.
Emarginate, 145.
Embryo, 390.
Endogens, *Endogenous*, 113, 132, 418.
Enneandrous, with 9 stamens.
Ensiform, sword-shaped, two-edged.
Entire, even-edged, 181.
Ephemeral, lasting but a day.
Epidermis, the skin, 9.
Epigynous, standing on the ovary.
Epiphytes, plants growing on other plants.
Equitant, 353.
Erose, 185. *Esculent*, eatable.
Exogens, 111, &c., 418.
Exotic, foreign, not native.
Exsérted, projecting out of, beyond the orifice.
Exsíccate, dried up.
Exstipulate, 226.
Extrorse (anthers), facing outward.
Falcate, sickle-shaped, linear and curved.

Family, 426.
Fascicle, 259.
Fasciculated, 41, 144.
Fastígiate, having a flat or level top.
Feather-veined, 166.
Fertile, fruit-bearing, 264.
Ferrùginous, iron-colored, rust-colored.
Fibrils, 34.
Fibrous, 38.
Filament, 309.
Filiform, thread-shaped.
Fimbriate, bordered with a fringe.
Fistulous, or *Fistular*, tubular, hollow.
Flexuous, bent in a wavy manner.
Florets, the flowers in a compound flower are sometimes so called, 253.
Flower, 261, &c.
Flower-bud, 64.
Flowering Plants, 21, &c.
Flowerless Plants, 21, &c.
Foliaceous, having the texture of leaves.
Follicle, 362.
Foot-stalks, the stalks of either flowers or leaves.
Fork-veined, 164.
Free, not adhering, 273.
Free central placenta, 327.
Fringed, the same as fimbriate.
Fruit, 355.
Frutéscent, shrubby, or woody.
Fugàcious, 232.
Funículus, the seed-stalk.
Funnel-shaped, 282.
Furcate, forked.
Fùsiform, spindle-shaped, 42.
Gàlea, the arched upper lip of a labiate corolla (285).
Geminate, in pairs.
Genus and *Genera*, 27.
Germ, the early name of the ovary.
Germination, 396.
Gibbous, swelled out, protuberant.
Glabrous, smooth, 13, 197.
Glands, the organs of secretion, or little bodies or swellings in the leaves or flowers, 12.
Glandular, gland-bearing.
Glaucous, sea-green; pale, bluish green, with a powder, or bloom.
Globòse, *Globular*, round, or spherical.
Glomerate, crowded together.
Glumaceæ, 422.
Glume, 280.
Granular, formed of, or covered with grains.
Grooved, furrowed, or channeled.
Gymnosperms, 420.
Gynandrous, having stamens and pistils combined into one body, 311: 20.
Hairs, 12.
Hastate, or *Halbert-shaped*, 172 : 11.
Habit, the general appearance of a plant.
Habitat, the place where a plant grows.
Head, 252, 253.
Heart-shaped, 171, 173.
Heart-wood, 126.
Helmet, the same as galea (285).
Heptandrous, with 7 stamens, 308 : 7.
Herb, 62. *Herbaceous*, herb-like.
Herbarium, 466, &c.
Hexandrous, having 6 stamens, 308: 6.
Hirsúte, 15.
Hispid, rough, with stiff hairs.
Hoary, 201.
Hooded, curved or rolled into the form of a hood.
Hybrid, partaking the nature of two species.
Hypocratériform, 283.
Hypógynous (309: 13), inserted under the ovary.
Imbricated, placed one over another, like the tiles upon a roof, 350.
Incised, 188.

Indefinite, variable in number, and too many to be readily counted.
Indehiscent, not opening, 369.
Indigenous, native of.
Inferior, 273.
Inflated, tumid, as if filled by wind.
Inflexed, bending inward.
Inflorescence, 236.
Infundibúliform, 282.
Inserted into, growing out of.
Internode, 71.
Involùcel, the involucre of an umbellet is so called.
Involùcrate, surrounded by an
Involùcre, 228.
Irregular flower, 338.
Keel (carina), 292.
Keeled, ridged and curved beneath like a boat.
Kidney-shaped (reniform), 171.
Labiate, 285.
Laciniate, 173, 189.
Lactescent, milky, or juicy.
Lamina (blade), 147, 278.
Lánceolate, 169: 6.
Lateral, on the side.
Leaf, 136, &c.
Leaf-bud, 64.
Leaflets, 207.
Legume, 363.
Leguminous, bearing legumes.
Lenticular, shaped like a double-convex lens.
Liber, 128.
Ligneous, woody.
Ligulate, strap-shaped, 287.
Liliaceous, 290.
Limb, 279.
Line, the twelfth part of an inch.
Linear, 176.
Linnèan Classes, 304, 410.
Linnèan Orders, 323.
Linnæ'us, 305, 410.
Lobate, or *Lobed*, 173.
Loment, a jointed legume.
Lunate, crescent-shaped.
Lyrate, 172.
Marginal, on the margin.
Medúlla, the pith.
Mĕdullary rays, 118, 120.
Membranous or *Membranaceous*, thin and soft, like a membrane.
Midvein, 158.
Monadelphous, stamens all united into one set, 311: 15.
Monandrous, with one stamen, 308: 1.
Monìliform, neck-lace form, or resembling a string of beads.
Monœcious, stamens and pistils apart, in separate flowers, on the same plant, 312: 21.
Monopetalæ, 491.
Monopetalous, 279.
Mucronate, 196.
Multifid, many-cleft.
Muricate, with hard, short points.
Naked, a relative term, signifying destitute of, or without.
Naked seeds, 358.
Napiform, 44.
Natant, swimming.
Natural System, 413, &c.
Natural Orders, 426, &c.
Nectariferous, producing honey.
Nectary, 293.
Net-veined, 162.
Neutral flowers, 264.
Nodding, in a drooping posture.
Node, 71. *Nodose*, knotted.
Nómenclature, 473.
Normal, regular, according to rule.
Nut, 375. *Nutlet*, a little nut.
Ob (in composition), implies inversion.
Oblong, 168.
Oblique, unequal, one-sided.
Obòvate, 170: 7.
Obsolete, indistinct, as if worn out.
Obtuse, blunt, 193.

Ochreæ, 225.
Offset, a short, thick runner.
Opposite, 75, 142.
Orbicular, 168.
Orders, 426.
Ordinal, relating to the orders.
Oval, 168 : 2.
Ovary, 316, &c.
Ovate, egg-shaped as to surface, 169 : 5.
Ovoid, egg-shaped as to a solid.
O'vules, 325.
Paleæ, the inner chaff, or grasses.
Palmate, 173.
Palmate-veined, see radiate-veined, 167.
Palmately trifoliate, 212.
Panduriform, fiddle-shaped.
Panicle, 256.
Papilionaceous, 292.
Pápillose, with small gland-like processes.
Pappus, 275.
Parasite, *Parasitic*, 46.
Parallel-veined, 163.
Parìetal, of, or adjoining the wall; as,
Parìetal placentæ, 328.
Pectinate, comb-like, with long, narrow segments.
Pedate, foot-shaped, 173 : 21.
Pedicel, 241.
Pedìcellate, furnished with a pedicel.
Peduncle, 240.
Pellùcid, transparent.
Peltate, 173.
Pendulous, drooping, hanging down.
Pentandrous, with 5 stamens. 308 : 5.
Pepo, 383.
Perennial, enduring three years or more.
Perfoliate, 220.
Pericarp, 360. *Perianth*, 262, 265.
Perìgynous, inserted into the calyx, 309 : 12.
Persistent, permanent, not falling off.
Personate, 285.
Pètal, 277.
Petaloid, resembling petals.
Petiole, and *Pétiolate*, 148.
Phænogàmia, 21, 415.
Pilose, 200.
Pinnæ (wings), the segments of a pinnate leaf.
Pinnate, 209.
Pinnately trifoliate, 212.
Pinnatifid, 172.
Pistil, 267.
Pistillate, bearing pistils.
Pith, 119.
Placenta, 327
Plaited (plicate), 354.
Plant defined, 5.
Plicate, folded like a fan.
Plumose, feathery, or feather-like.
Plumule, 7.
Pod, dry fruit; as, capsule, legume, &c.
Pollen, 302.
Poly (in composition), signifies many; as,
Polyandrous, with many stamens.
Polyadélphous, stamens united into several sets.
Poly'gamous, having perfect flowers, with staminate or pistillate on the same plant.
Polypétalæ, 421.
Polypétalous, 277.
Polysépalous, 272.
Pome, 382.
Premorse, 43.
Prickles, sharp, stiff processes of the epidermis, 12.
Procumbent, trailing along the ground.
Process, any projection from the surface.
Prostrate, lying flat upon the ground.
Pubescent, 14, 198.
Pulp, the soft, juicy part of fruits.

Punctate, dotted as if with points.
Py'riform, pear-shaped.
Pyxis, 381.
Quaternate, growing in fours.
Quinate, growing in fives.
Raceme, 241.
Racemose, resembling a raceme.
Rachis, 245.
Radiate, and *Radiant*, 255.
Radiate-veined, 167.
Radical, 98, 145.
Radicle, 7.
Ramial, of the branches, 146.
Ramose, branched, 36.
Ray, *Ray-flowers*, 254.
Receptacle, 253, 268.
Recurved, bent or curved backward.
Reflexed, curved back and downward.
Regular flower, 337.
Reniform, kidney-shaped, 171.
Repand, 191.
Reticulate, netted, 162.
Retuse, with a blunt notch in a blunt end.
Revolute, rolled backward.
Rhizoma, 88.
Rhomboid, or *Rhombic*, oval, with angular sides.
Rib (costa), a ridge caused by raised veins.
Ringent, 285.
Root, 30, &c.
Root-stalk, see Rhizoma (88).
Rosaceous, 289.
Rostrate, with a beak.
Rotate, 284.
Rugose, 205.
Runcinate, 172.
Runner, 96.
Saccate, bag-like, or sack-like.
Sagittate, 171.
Samara (a key), 380.
Sap, 130. *Sap-wood*, 125.
Scabrous, rough, 16, 169.
Scape, 97, 242.
Scarious, dry, thin, scale-like.
Secund, all turned to one side.
Seed, 388, &c.
Segments, parts, or divisions.
Sèpal, 271.
Septinate, 218.
Serìceous, silky.
Seròtinous, late in the season.
Serrate, and *Serrulate*, 183.
Sessile, 148, 240.
Setaceous, or *Setose*, bristly.
Sheath, the lower part of the leaf, or leaf-stalk, which surrounds the stem.
Shrub, 60.
Silicle, and *Silique*, 364, 365.
Simple, not compounded, of one piece.
Sinuate, 172.
Sinus, a rounded recess between the lobes of leaves, &c.
Spadix, and *Spathe*, 248.
Spatulate, 170.
Species, 24.
Spike, 244.
Spine, 109.
Spinéscent, or *Spinous*, 187.
Spongelets, 35.
Spores, 23.
Spur, 295.
Squarrose, of a ragged appearance; as, with crowded, spreading bracts, or leaves, &c.
Stamens, 266, 298.
Staminate, with stamens only, barren.
Stellate, 221.
Stem, 54, &c.
Sterile, barren, unfruitful, 264.
Stigma, 323.
Stings, sharp, poisonous hairs, 11.
Stipe, the stalk of a pod, &c.
Stipitate, borne on a stipe.
Stípule, 224.
Stipulate, 226.

Stolon, 108. *Stoloniferous*, bearing stolons.

Straight-veined, where the principal veins pass direct to the margin.

Striate, slightly furrowed with streaks.

Strigose, clothed with short, stiff, and close-pressed hairs.

Stróbile, 387.

Style, 320.

Sub (in composition), 223.

Submersed, under water.

Subulate, awl-shaped.

Succulent, thick, juicy, fleshy.

Sucker, 107.

Superior, 273.

Supra-axillary, 239.

Suture, 369.

Symmetrical, 337.

Syngenesious, having the anthers united into a tube, 311: 19.

Systematic Botany, 400, &c.

Tendril, 100.

Terete, rounded, or cylindric.

Terminal, borne at the summit, 66.

Ternate, 211.

Testa, the outer seed-coat.

Tetrady'namous, with 2 short and 4 long stamens, 310: 15.

Tetrandrous, with 4 stamens, 308: 4.

Thallogens, 423.

Thallus, that part of the Lichen which bears the fruit.

Thorn, 109.

Throat, the orifice or tube of the corolla.

Thyrse, 257.

Tissues, Vegetable, 8.

Tomentose, 17, 204.

Toothed, dentate, 182.

Torus, the receptacle, 268.

Trailing, creeping or lying on the ground.

Tree, 59.

Triandrous, with 3 stamens, 308: 3.

Tricuspidate, having 3 points.

Tridentate, three-toothed.

Trifid, three-cleft.

Trifoliate, 3 leaves or leaflets growing together.

Tripinnate, 214.

Triternate, 216.

Truncate, blunt, as if cut square off.

Trunk, 104.

Tube, 279.

Tuber, 87. *Tuberiferous*, tuber-bearing.

Tuberous, thickened like a tuber.

Tubular, hollow, like a tube, 286.

Tunicated, coated, 84.

Turbinate, shaped like a top.

Turgid, swollen.

Umbel, 250.

Umbellet, 251.

Umbillicate, depressed in the centre.

Unarmed, 109.

Uncinate, hooked at the end.

Under shrub, 61.

Undulate, wavy, 186.

Unguiculate, clawed, with a claw.

Unsymmetrical, 339, 340.

U'rceolate, urn-shaped. Fig.

Utricle, 379.

Valvate, 347.

Valves, the parts which open, 367.

Variety, an unusual form of a species.

Veinlets, 159.

Veins, 158.

Veinulets, 160.

Velvety, clothed with thick, soft down.

Venation, 156.

Ventral suture, the front seam.

Ventricose, swelling out on one side.

Vernation, 352.

Verrucose, warty.

Verticil, 260.

Verticillate, 76, 143.

Vexillum, see Banner, 292.

Villous, or *Villose*, 202.

Vine, 99.
Virgate, wand-shaped, terete, and slender.
Wedge-shaped, see *Cuneate*.
Wheel-shaped, see *Rotate*.
Whorled, 76, 143.
Winged, as if furnished with wings.
Wings, 292.
Wood, 122.
Woody tissue, or *Fibre*, 123.

INDEX

OF THE NATURAL ORDERS AND GENERA.

The Natural Orders are in Capitals, the Genera in Roman, and the English names in Italic.

Abutilon, 134
Acacia, 140
Acer, 137
ACERACEÆ, 136
Acerates, 216
Achillea, 180
Aconitum, 104
Acorus, 221
Actæa, 103
Actinomeris, 172
Actinospermum, 172
Adenarium, 128
Adonis, 107
Æschynomene, 140
Æthusa, 160
Agave, 230
AGLUMACEÆ, 221
Agrimonia, 146
Alchemilla, 146
Alder, 220
Alisma, 223
ALISMACEÆ, 222
Alismads, 222
Almond, 146
Alnus, 220
Althea, 135
Alyssum, 115
Amaryllids, 229
AMARYLLIDACEÆ, 229
Amaryllis, 230
Amelanchier, 147
Amianthium, 238
American Centaury, 212
American Cowslip, 190
Amorpha, 139
Amphianthus, 191
Amphicarpæa, 140
Amsonia, 213
Amygdalus, 146
Anagallis, 189
Androcera, 209
Andromeda, 185
Androsace, 189
Anemone, 104
Anise, 160
Anthemis, 173
Antirrhinum, 192
APETALÆ, 217
Apios, 142
Apium, 160
Aplectrum, 225
APOCYNACEÆ, 212
Apocynum, 213
Apogon, 173
Apple, 147
Apple-of-Peru, 209
Apricot, 146
Aquilegia, 107
Arabis, 119
ARACEÆ, 221
Archangelica, 160
Archemora, 159
Arctostaphylus, 185
Arenaria, 128
Arethusa, 226
Argemone, 113
Armeniaca, 146
Arnica, 172
Aroids, 221
Arrow-Head, 223
Arum, 221
ASCLEPIADACEÆ, 214
Asclepias, 215
Asparagus, 234
Asphodel, 234
Asphodelus, 234
Aster, 178
Asterworts, 169
Astilbe, 157
Astragalus, 139
Atropa, 209
Auricula, 189
Avens, 149
Awlwort, 116
Azalea, 185

Baldwinia, 172
Ballota, 200
Baptisia, 144
Barbarea, 120
Bartonia, 211
Bean, 142
Bear-berry, 185
Beard-flower, 227
Beard-tongue, 192
Beech-drops, 186
Befaria, 186
Belladonna, 209
Bell-flower, 182
Bellis, 173
Bellworts, 181, 236
BERBERIDACEÆ, 109
Berberids, 109
Berberis, 110
Berberry Bush, 110

Berlandiera, 172
Betula, 220
BETULACEÆ, 219
Bidens, 177
Bindweed, 207, 208
Birch, 220
Birchworts, 219
Bitter Cress, 119
Bitter-sweet, 210
Black-berry, 148
Blephylia, 198
Bletia, 225
Blood-root, 114
Blue-berries, 185
Blue-curls, 200
Bluets, 168
Blue-eyed Grass, 231
Blue-hearts, 192
Boltonia, 173
Borrage, 203
Borrageworts, 202
BORRAGINACEÆ, 202
Borrago, 203
Borichia, 173
Boxberry, 185
Brachychæta, 172
Bramble, 148
Brassica, 116
Buchnera, 192
Buck-bean, 211
Buck-wheat, 217, 218
Bug-bane, 103
Bugloss, 203
Bupleurum, 160
Burdock, 170
Burnet, 146
Burnet Saxifrage, 146
Burr-Marigold, 177
Burr-seed, 203
Bush Clover, 142
Bush Honeysuckle, 166
Butter-cups, 105
Button-bush, 167
Cabbage, 116
Cakile, 116
Caladium, 221
Calamintha, 200
Calendula, 172
Calico-bush, 187
Calla, 222
Callistephus, 173
Calochortus, 233
Calonyction, 208
Calopogon, 228
Caltha, 103
Calypso, 226
Calystigia, 208
Camelina, 116
Camomile, 173
Campanula, 182
CAMPANULACEÆ, 182
Candytuft, 117
Canterbury Bells, 183
Capsella, 117
Capsicum, 209
CAPRIFOLIACEÆ, 164
Caraway, 160
Cardamine, 119
Carnation, 129
Carpet-weed, 128
Carrot, 160
Carum, 160
CARYOPHYLLACEÆ, 128
Cassia, 144
Castilleja, 192
Catch-fly, 130
Catnep, *Catmint*, 201
Cedronella, 200
Celery, 160
Centaury, 211
Centrosema, 140
Centunculus, 189
Cephalanthus, 167
Ceranthera, 200
Cerastium, 128
Cerasus, 147
Cercis, 139
Chærophyllum, 160
Chaff-seed, 192
Chamælirium, 238
Chapmannia, 139
Chaptalia, 173
Chelidonium, 113
Cheranthus, 115
Chelone, 194
Cherry, 147
Chick Wintergreen, 189
China Aster, 173
Chiogenes, 185
Chrysogonum, 172
Chrysopsis, 172
Chrysosplenium, 157
Chimaphila, 186
Cicely, 162
Cichorium, 174
Cimicifuga, 103
Cinquefoil, 149
Circæa, 153
Cladastrus, 139
Clethra, 186
Clematis, 103
Clinopodium, 200
Clitoria, 140
Clivers, 167
Clover, 143
Cochlearia, 116
Cockle, 130
Coffee Bean, 139
Cohosh, 103
Collinsia, 192
Collinsonia, 199
Columbo, 211
Colt's-foot, 172
Columbine, 107
Colutea, 139
Comarum, 145, 146
Comfrey, 203
COMPOSITÆ, 169
Cone-flower, 172, 173
Conium, 162
Conioselinum, 160
Conobea, 192
Convallaria, 237
CONVOLVULACEÆ, 207
Convolvulus, 208
Coptis, 107
Coral-berry, 165
Corallorhiza, 226
Coral-root, 226
Corn-flag, 231
Coriander, 160
Coriandrum, 160
Coreopsis, 177
CORNACEÆ, 163
Cornel, 163, 164
Cornus, 164
Coronilla, 139

Cosmanthus, 205
Cotton, 135
Cow Wheat, 192
Cranberry, 186
Cranichia, 226
Crantzia, 159
CRASSULACEÆ, 156
Cratægus, 146
Cress, 116
Crinum, 230
Crocus, 231
Crotalaria, 139
Crow-foot, 101, 105
Crown-beard, 173
Crown Imperial, 233
CRUCIFERÆ, 114
Cryptotænia, 162
Cunila, 198
Cuscuta, 207
Currant, 155
Cydonia, 146
Cynoglossum, 203
Cynthia, 173
Cypress-Vine, 208
Cypripedium, 229
Cyrilla, 186

Daffodil, 230
Dahlia, 173
Daisy, 173
Dalea, 139
Dalibarda, 151
Dandelion, 180
Darlingtonia, 140
Datura, 209
Dasystoma, 197
Daucus, 159
Day Lily, 234
Decumaria, 157
Delphinium, 105
Dentaria, 119
Desmodium, 140
Diamorpha, 156
Dianthus, 129
Diervilla, 166
Digitalis, 192
Diodia, 167
Dionæa, 124
Diplopappus, 173
Discopleura, 159
Dittany, 198
Dock, 217
Dodder, 207
Dodecatheon, 190
Dogbanes, 212, 213
Dog-tooth Violet, 234
Dogwood, 154
Dolichos, 140
Draba, 118
Dracocephalum, 200
Dragon-head, 200
Dragon's-claw, 226
Dragon-root, 221
Dropwort, 152
Drosera, 124
DROSERACEÆ, 124
Dryas, 146
Dry Strawberry, 151
Dwarf-Pink, 168
Dysodia, 172

Echinodorus, 223
Echinospermum, 203
Echites, 213
Echium, 203
Eclipta, 173
Egg-plant, 210
Elder, 166
Elecampane, 172
Eliothi, 186
Ellisia, 205
Enchanter's Nightsha. 153
Euslenia, 215
Epidendrum, 226
Epigæa, 185
Epilobium, 154
Erica, 185
ERICACEÆ, 184
Erigenia, 150
Erigeron, 179
Erodium, 132
Eryngium, 159
Erysimum, 120
Erythræa, 211
Erythrina, 140
Erythronium, 234
Eschscholtzia, 113
Eulophus. 160
Euphrasia, 192
Evening Primrose, 152-3
Eye-bright, 192

Faba, 139
False Aloe, 230
False Gentian, 198
False Hellebore, 238
False Indigo, 140
False Gromwell, 204
False Mitrewort, 169
False Rocket, 116
False Sneezwort, 172
False Sunflower, 173
False Syringa, 158
False Violet, 151
False Wall-flower, 120
False Wintergreen, 187
Feniculum, 160
Fennel, 160
Fennel-flower, 103
Fever-root, 165
Figworts, 190
Fleabane, 179
Floating-heart, 211
Flower-of-an-hour, 134
Flower-de-luce, 231
Forget-me-not, 203
Foxglove, 192
Fragaria, 148
Frasera, 211
Fritillaria, 233
Fuchsia, 153
Funkia, 234

Gaillardia, 172
Galactia, 140
Galanthus, 230
Galium, 167
Galliopsis, 200
Garlic, 235
Gaultheria, 185
Gaura, 153
Gem-fruit, 158
Genista, 139
Gentian, 211
Gentiana, 211
GENTIANACEÆ, 210
Gentianworts, 210

Gerania, 131
GERANIACEÆ, 131
Geranium, 132
Gerardia, 197
Geum, 149
Gilia, 206
Gillenia, 147
Gladiolus, 231
Glaucium, 113
Glaux, 189
Gleditschia, 140
Globe-flower, 103
Glottidium, 139
Glycirrhiza, 139
Goat's Rue, 139
Golden Alexanders, 163
Goldenrod, 174
Goldthread, 107
Gonolobus, 215
Goodyera, 226
Gooseberry, 155
Grass Pink, 228
Gratiola, 193
Gromwell, 205
GROSSULACEÆ, 155
Ground-nut, 142
Gymnocladus, 140

Halenia, 211
Hardhack, 151
Hare-bell, 182
Hawk-weed, 180
Heath-worts, 184, 185
Hedeoma, 199
Hedge Hyssop, 193
Hedge Mustard, 119
Hedge Nettle, 200
Hedyotis, 168
Hedysarum, 140
Helenium, 172
Helianthus, 176
Heliopsis, 173
Heliotropium, 203
Helleborus, 103
Hellebore, 103
Helonias, 238
Helosciadium, 159
Hemerocallis 234
Hemianthus, 192
Hemp Nettle, 200
Hepatica, 105
Heracleum, 159
Herpestis, 192
Hesperis, 115
Heterotheca, 172
Henchera, 157
Hibiscus, 135
Hieracium, 180
Hippuris, 152, 153
Hollyhock, 135
Honewort, 162
Honey Locust, 140
Honeysuckle, 164, 165
Horehound, 200
Horse Balm, 199
Horse Nettle, 210
Horse Radish, 116
Hottonia, 189
Hound-tongue, 203
House-leek, 156
Hyacinth, 233
Hyacinthus, 233
Hydrangea, 157
Hydrastis, 103
Hydrocotyle, 159
HYDROPHYLLACEÆ, 205
Hydrophylls, 205
Hydrophyllum, 205
Hyoscyamus, 209
HYPERICACEÆ, 126
Hypericum, 126
Hypopitys, 186
Hypoxis, 230
Hyptis, 199
Hyssopus, 200

Iberis, 117
Illicum, 108
Ilysanthus, 192
Indian Pipes, 186
Indian Tobacco, 181
Indian Turnip, 221
Indigofera, 139
Inula, 172
Iodanthus, 116
IRIDACEÆ, 230
Irids, 230
Iris, 231
Irish Moss, 156, 157
Isanthus, 199
Isopappus, 172
Isopyrum, 103
Itea, 157

Jeffersonia, 109
Jerusalem Cherry, 210
Jonquil, 230
Judas-tree, 139
JUNCAGINEÆ, 222
June-berry, 147
Jussiæa, 154

Kalmia, 187
Kerria, 147
Knot-weed, 217
Krigia, 173

LABIATÆ, 198
Labiate Plants, 198
Labrador Tea, 186
Laburnum, 138
Lactuca, 173, 174
Ladies' Slipper, 229
Ladies' Tresses, 229
Lamium, 200
Lampsana, 173
Lark-spur, 105
Lathyrus, 139
Lavatera, 134
Lavandula, 199
Lavender, 199
Lavenworthia, 116
Ledum, 186
LEGUMINOSÆ, 137
Leguminous Plants, 137
Leiophyllum, 186
Leontice, 109
Leontodon, 174
Leonurus, 200
Lepachys, 172
Lepidium, 117
Leptocaulis, 160
Leptopoda, 172
Lepuropetalon, 157
Lespedeza, 142
Leucanthemum, 173
Leucas, 20

Leucojum, 230
Ligusticum, 160
LILIACEÆ, 233
Lilium, 235
Lily, 235
Lilyworts, 233
Lily-of-the-Valley, 237
Limnanthemum, 211
Limosella, 192
Linaria, 194
Linnæa, 165
Liparis, 225
Liquorice, 139
Liriodendron, 109
Listera, 225
Lithospermum, 205
Lobelia, 181
LOBELIACEÆ, 181
Lobeliads, 181
Locust, 141
Lonicera, 165
Loose-strife, 190
Lophanthus, 200
Lousewort, 192
Lovage, 160
Ludwigia, 153
Lunaria, 117
Lungwort, 203
Lupine, 141
Lupinus, 141
Lychnidea, 206
Lychnis, 130
Lycium, 209
Lycopus, 201
Lygodesmia, 174
Lysimachia, 190

Macbridea, 200
Macranthera, 193
Madwort, 115
Magnolia, 108
MAGNOLIACEÆ, 108
Magnoliads, 108
Majorana, 200
Mallows, 133
Malope, 134
Malva, 134
MALVACEÆ, 133
Maples, 136
Marigold, 172
Marjorum, 201
Marrubium, 200
Marsh Mallow, 135
Marsh Marigold, 106
Maruta, 173
Matrimony-vine, 209
Matthiola, 115
May Apple, 109
May-flower, 185
May-weed, 173
Meadow Rue, 103
Meadow-sweet, 151
Meconopsis, 113
Medeola, 232
Medicago, 140
Medick, 140
Melampyrum, 192
Melilotus, 140
MELANTHACEÆ, 237
Melanthium, 238
Melanths, 237
Mentha, 200
Melissa, 200
Menziesia, 185
Mertensia, 203
Microstylis, 225
Menyanthes, 211
Milk Vetch, 139
Milk-weed, 215, 216
Milkworts, 120
Millfoil, 180
Mimulus, 195
Mint, 200
Mitchella, 167
Mitella, 158
Mitreola, 169
Mitrewort, 158
Mock Orange, 159
Modesty, 160
Modiolia, 134
Mollucella, 200
Mollugo, 128
MONOPETALÆ, 164
Monarda, 201
Moneses, 186
Monkey-flower, 195
Monk's-hood, 104
Monotropa, 186
Monotropsis, 186
Motherwort, 200
Morning Glory, 208
Mountain Laurel, 187
Mountain Mint, 201
Mouse-ear, 128
Mouse-tail, 103
Mud-flower, 192
Mudwort, 192
Mulgedium, 174
Mullein, 193
Mullein Pink, 130
Mustard, 120
Mustardworts, 114
Mylocarium, 186
Myosotis, 203
Myosurus, 103
Myriophyllum, 153

Narcissus, 230
Nardosmia, 173
Nasturtium, 116
Naumbergia, 189
NELUMBIACEÆ, 110
Nelumbo, 110
Nelumbium, 110
Nepeta, 201
Nerium, 213
Neurophyllum, 159
Nicandra, 209
Nicotiana, 209
Nigella, 103
Nightshades, 209
Ninebark, 152
Noble Liverwort, 105
Nolina, 233
NYMPHÆACEÆ, 111
Nymphæa, 111

Obolaria, 211
Ocymum, 199
Œnothera, 153
Oleander, 213
ONAGRACEÆ, 152
Onion, 235
Onosmodium, 204
ORCHIDACEÆ, 225
Orchids, 225
Orchis, 226

Origanum, 200
Ornithogalum, 233
Orontium, 221
Orpine, 158
Osmorhiza, 162
Otophylla, 193
OXALIDACEÆ, 132
Oxalis, 133
Oxycoccus, 186
Oxyria, 217

Pæonia, 103
Painted-cup, 192
Pancratium, 230
PAPAVERACEÆ, 113
Papaver, 114
Pappoose-root, 109
Pardanthus, 231
Paulownia, 188
Parsley, 160
Parsnip, 160
Parthenium, 173
Partridge-berry, 167
Pasque-flower, 104
Pastinaca, 160
Pea, 141
Peach, 146
Pedicularis, 192
Pelargonium, 132
Peltandra, 221
Pentalophus, 203
Penthorum, 156
Pentstemon, 192
Pennywort, 211
Pepper, 209
Pepper-grass, 117
Peppermint, 202
Pepper-root, 119
Periwinkle, 213
Periploca, 215
Persica, 146
Petalostemon, 139
Petroselinum, 160
Petunia, 209
Phaca, 139
Phacelia, 205
Phaseolus, 142
Pheasant's-eye, 107
Philadelphus, 158
Phlomis, 200
Phlox, 206
Phloxworts, 206
Physalis, 209
Physostegia, 200
Phytolacca, 219
PHYTOLACCACEÆ, 219
Pie-plant, 217
Pigweed, 170
Pinckneya, 167
Pine-sap, 186
Pink, 129
Pinkworts, 128
Piny, 103
Pitcheria, 140
Pisum, 141
Plectranthus, 199
Pleea, 238
Plum, 146
Podophyllum, 109
Podostigma, 215
Pogonia, 227
Poison Hemlock, 162
Poke, 219, 238
Poke-weeds, 219
Polemonium, 206
POLEMONIACEÆ, 206
Polyanthus, 230
Polygala, 121
POLYGALACEÆ, 120
POLYGONACEÆ, 217
Polygonum, 217
Polymnia, 172
POLYPETALÆ, 101
Polypremum, 192
Polytænia, 160
Pimpinella, 160
Poplar, 109
Poppy, 114
Potato, 210
Potentilla, 149
Poterium, 146
Primrose, 189
Primula, 189
PRIMULACEÆ, 188
Primroseworts, 188
Proserpinaca, 153
Prunella, 200
Prunus, 146
Psoralea, 140
Pterospora, 186
Pulmonaria, 203
Pycnanthemum, 200
Pyrola, 187
Pyrrhopappus, 173
Pyrus, *Pear*, 147

Quamoclit, 208
Queen-of-the-Prarie, 152
Quince, 146

Radish, 116
RANUNCULACEÆ, 101
Ranunculus, 105
Raphanus, 116
Raspberry, 148
Rattle-pod, 139
Rheum, 217
Rheumatism-root, 109
Rhinanthus, 192
Rhododendron, 186
Rhodora, 186
Rhynchosia, 140
Ribes, 155
Rivina, 219
Robinia, 141
Rock Cress, 119
Rocket, 115
Rosebay, 186
ROSACEÆ, 145
Rosa, *Rose*, 147
Rosemary, 200
Rosmarina, 200
RUBIACEÆ, 167
Rubus, 148
Rudbeckia, 172
Rumex, 217

Sabbatia, 212
Sage, 199
Sage Geranium, 199
Sagina, 128
Sagittaria, 223
Salvia, 199
Sambucus, 166
Samolus, 189
Sanguinaria, 114
Sanguisorba, 146

Sanicle, 161
Sanicula, 161
Saponaria, 128
Sarracenia, 112
SARRACENIACEÆ, 112
Satin-flower, 117
Satureja, 200
Saxifraga, 157
Saxifrage, 157
SAXIFRAGACEÆ, 157
Scheuchzeria, 222
Schizanthus, 191
Schœnocaulon, 238
Schrankia, 140
Schwalbea, 192
Scilla, 233
Scorpion-grass, 203
Scotch-Broom, 139
Screw-Stem, 211
SCROPHULARIACEÆ, 191
Scull-cap, 202
Scutellaria, 202
Sea Rocket, 116
Sedum, 156
Semi-flower, 192
Sempervivum, 156
Senebiera, 118
Senecio, 172
Sericocarpus, 173
Sesbania, 139
Sentera, 215
Seymeria, 193
Shell-flower, 200
Shepherd's-Purse, 117
Sibbaldia, 147
Sickle-pod, 119
Sida, 134
Silene, 130
Silk-grass, 215
Silphium, 172
Sinapis, 120
Sisyrinchium, 231
Sium, 159
Smilacina, 237
Snake-head, 195
Snap-dragon, 192
Sneezwort, 172
Snow-berry, 165
Snow-drop, 230
Snow-flake, 230
SOLANACEÆ, 209
Solanum, 210
Solidago, 174
Solomon's Seal, 234, 237
Sonchus, 173
Sorrel, 217
Specularia, 182
Speedwell, 194
Spermacoce, 167
Spigelia, 167
Spirea, 151
Spiranthes, 229
Stachys, 200
Star-grass, 230
Star-of-Bethlehem, 233
Starwort, 178
Stellaria, 128
Stock, 115
St. John's-wort, 126
Stonecrop, 156
St. Peter's-wort, 152
Stramonium, 209
Strawberry, 148
Streptopus, 234
Stylosanthes, 140
Subularia, 116
Sullivantia, 157
Summer-Savory, 200
Sundews, 124
Sunflower, 176
Swamp Pink, 186
Sweet Basil, 189
Sweet-Flag, 221
Symphytum, 203
Symplocarpus, 221
Symphoricarpus, 165
Synandra, 200
Synthiris, 191

Tagetes, 172
Tall Hyssop, 200
Tall Pink, 192
Taraxacum, 180
Tephrosia, 139
Tetragonotheca, 172
Teucrium, 200
Thalictrum, 103
Thaspium, 163
Thornbush, 146
Thyme, 200
Thymus, 200
Tiarella, 158
Tickseed, 177
Tiedmannia, 159
Tiger-flower, 231
Tigridia, 231
Tillæa, 156
Tipularia, 225
Toad-flax, 192
Tobacco, 209
Tofieldia, 238
Tomato, 210
Tooth-root, 119
Tragopogon, 174
Trautvetteria, 103
Trientalis, 189
Trefoil, 143
Triglochin, 222
TRILLIACEÆ, 232
Trilliads, 232
Trillium, 232
Triosteum, 165
Troximon, 173
Trichostemma, 200
Tuberose, 233
Tulip, 233
Tulipa, 233
Tulip Tree, 109
Turnsol, 203
Turritis, 116
Tussilago, 172
Twin-flower, 165
Twin-leaf, 109
Twist-foot, 234

UMBELLIFERÆ, 159
Umbelworts, 159
Uvularia, 236

Vaccinium, 185
Vachellia, 140
Venus' Fly-trap, 124
Veratrum, 238
Verbascum, 193
Verbesina, 172
Veronica, 194

Viburnum, 165
Vicia, 139
Vinca, 213
Viola, 122
VIOLACEÆ, 122
Violets, 122
Vetch, 139

Wake-Robin, 232
Waldsteinia, 151
Wall-flower, 115
Warea, 116
Water-carpet, 157
Water Hemlock, 162
Water Horehound, 201
Water-leaf, 205
Water Lily, 111
Water Pitchers, 112
Water Plantain, 223
White-weed, 179
White-wood, 109
Whitlow-grass, 118
Wild Indigo, 144
Wild Senna, 144
Willow-herb, 154
Winter Cress, 120
Wistaria, 139
Wolf-berry, 165
Wood-sorrel, 122

Xerophyllum, 238

Yarrow, 180
Yellow Day-lily, 234
Yellow Gerardia, 197
Yellow Rattle, 192
Yellow-root, 103
Yucca, 234

Zanthorhiza, 103
Zigadenus, 238
Zinnia, 173
Zizia, 163
Zornia, 139

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